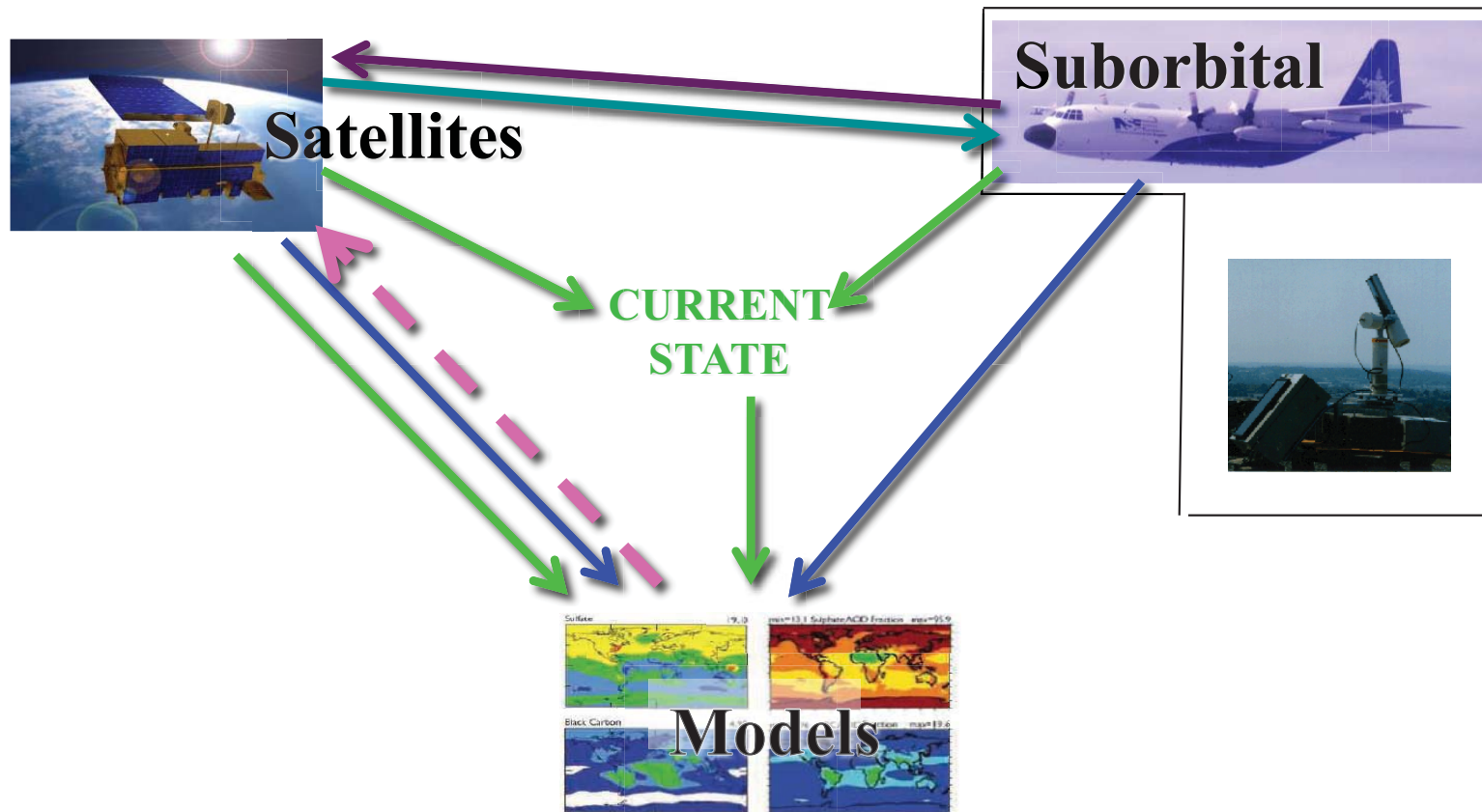


# A Three-way Street:

*MISR* and *MODIS* Provide Context,  
*SEAC4RS* Provides Detail and Validation,  
*Models* Compete the Picture

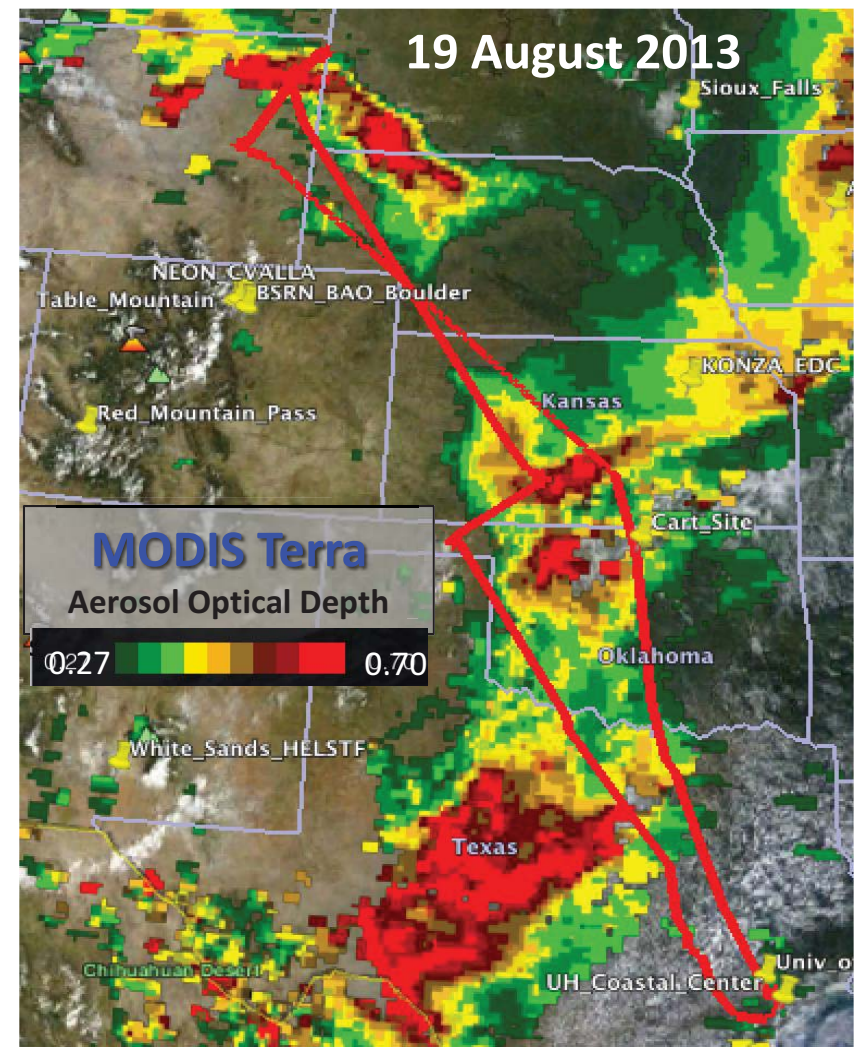
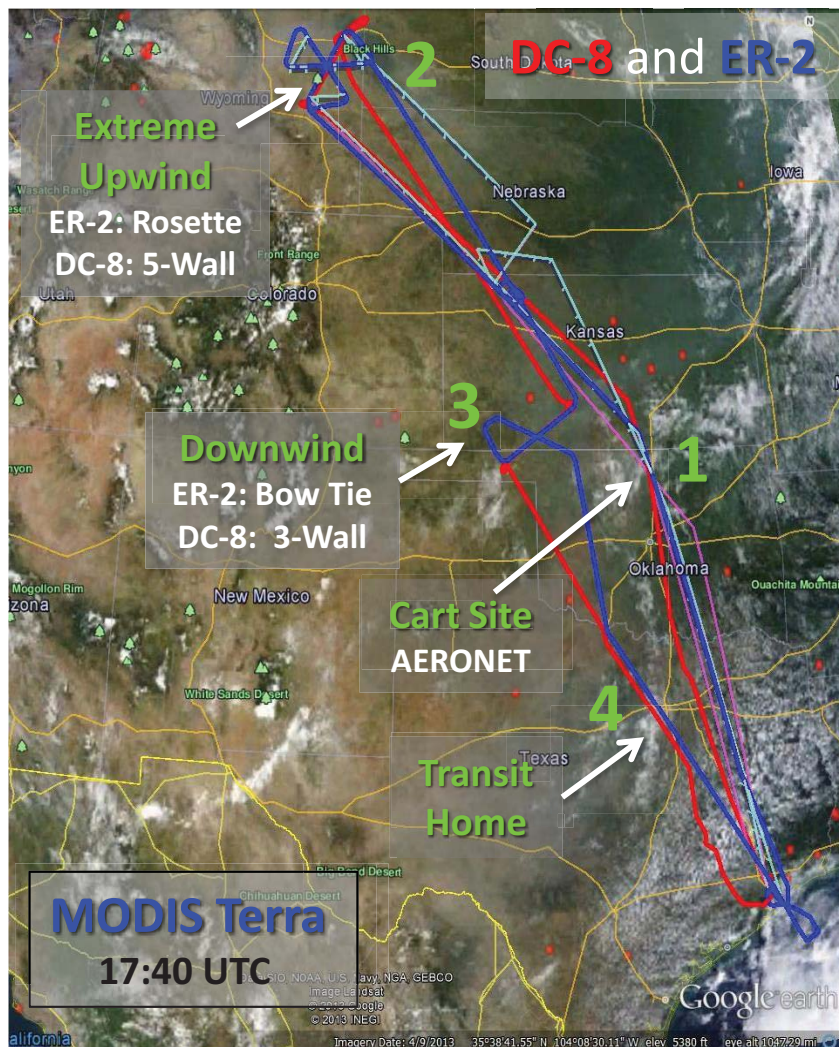
*Ralph Kahn*

NASA Goddard Space Flight Center



# Transported Smoke Survey Objectives

- Evaluate Imager & Polarimeter *Sensitivity to Smoke Properties* [*remote sensing validation*]
- Study Characteristics of *Transported Smoke* [chemistry/*transport*]
- Assess *Radiative Impact of Smoke* Layers [radiation closure]





**All Data Shown Are Preliminary**

**Please Contact the Individual Instrument Teams  
For Further Information**

# **MISR** (Multi-angle Imaging SpectroRadiometer) Overpass

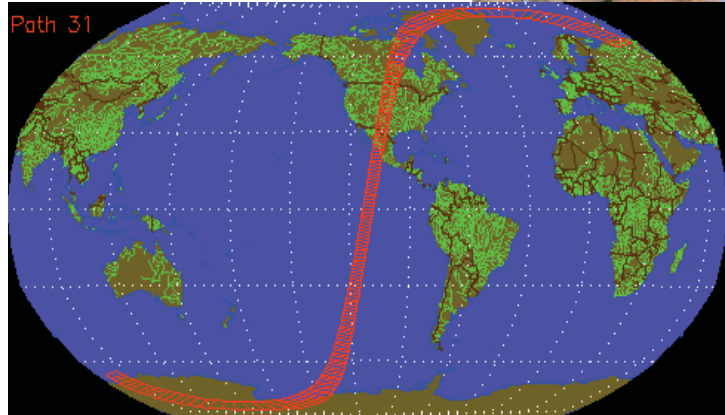
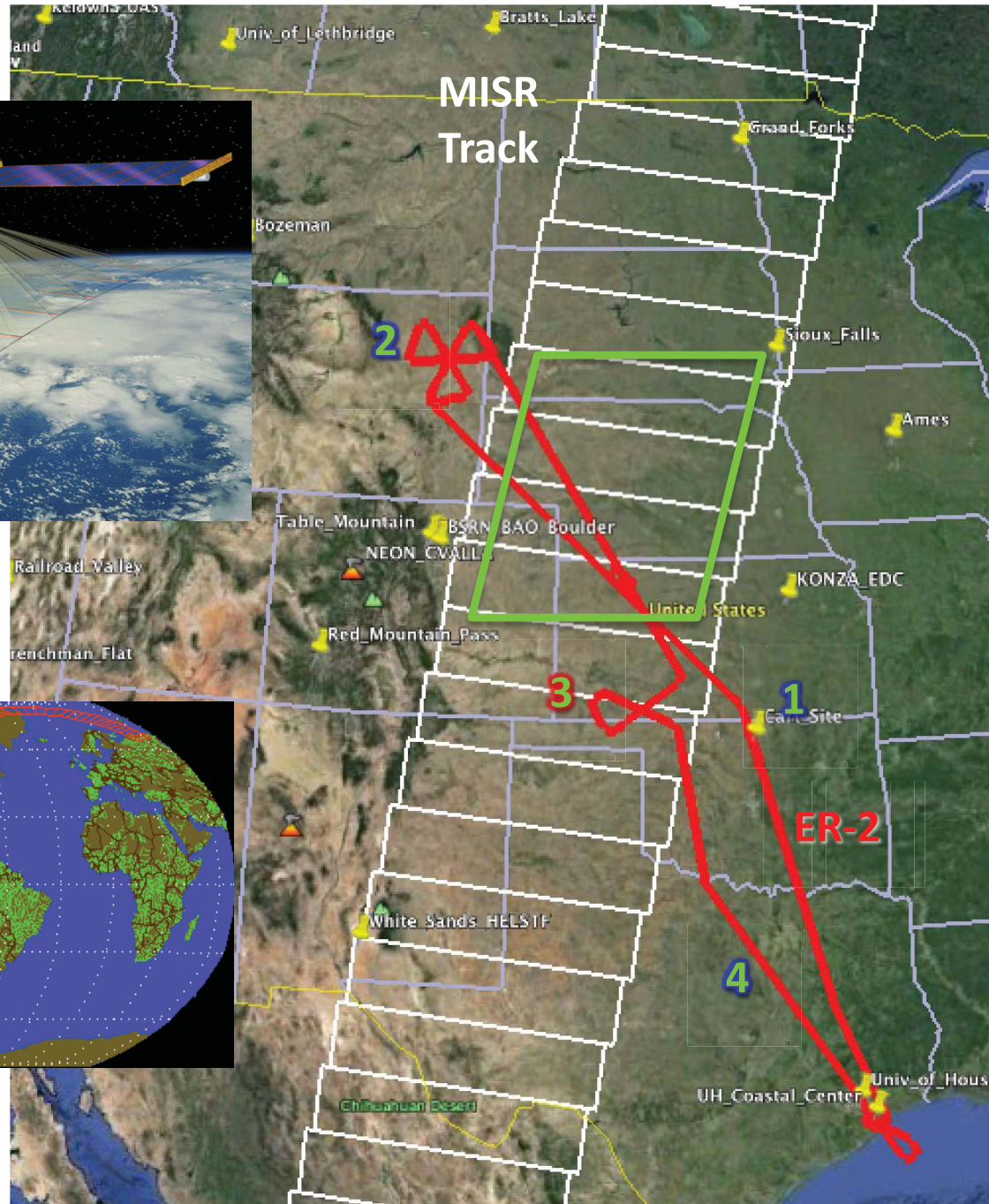
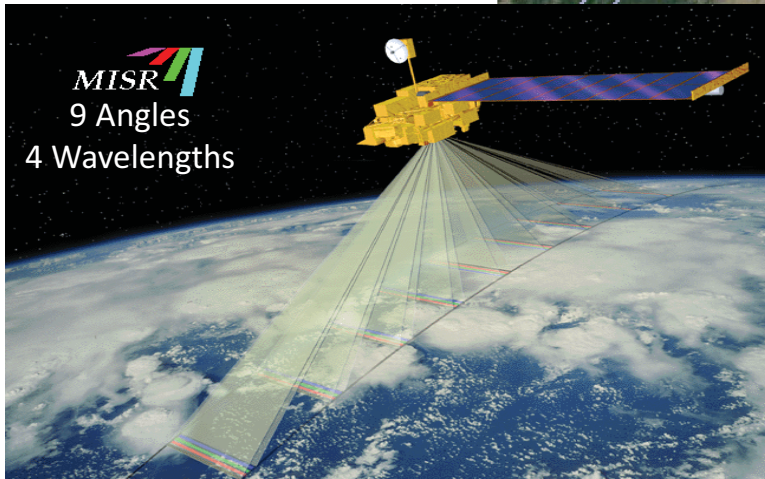
Monday, 19 August 2013 17:40 UTC

**17:40 UTC**  
**Path 031**  
**Orbit 72716**

**South Dakota**

**Nebraska**

**Kansas**

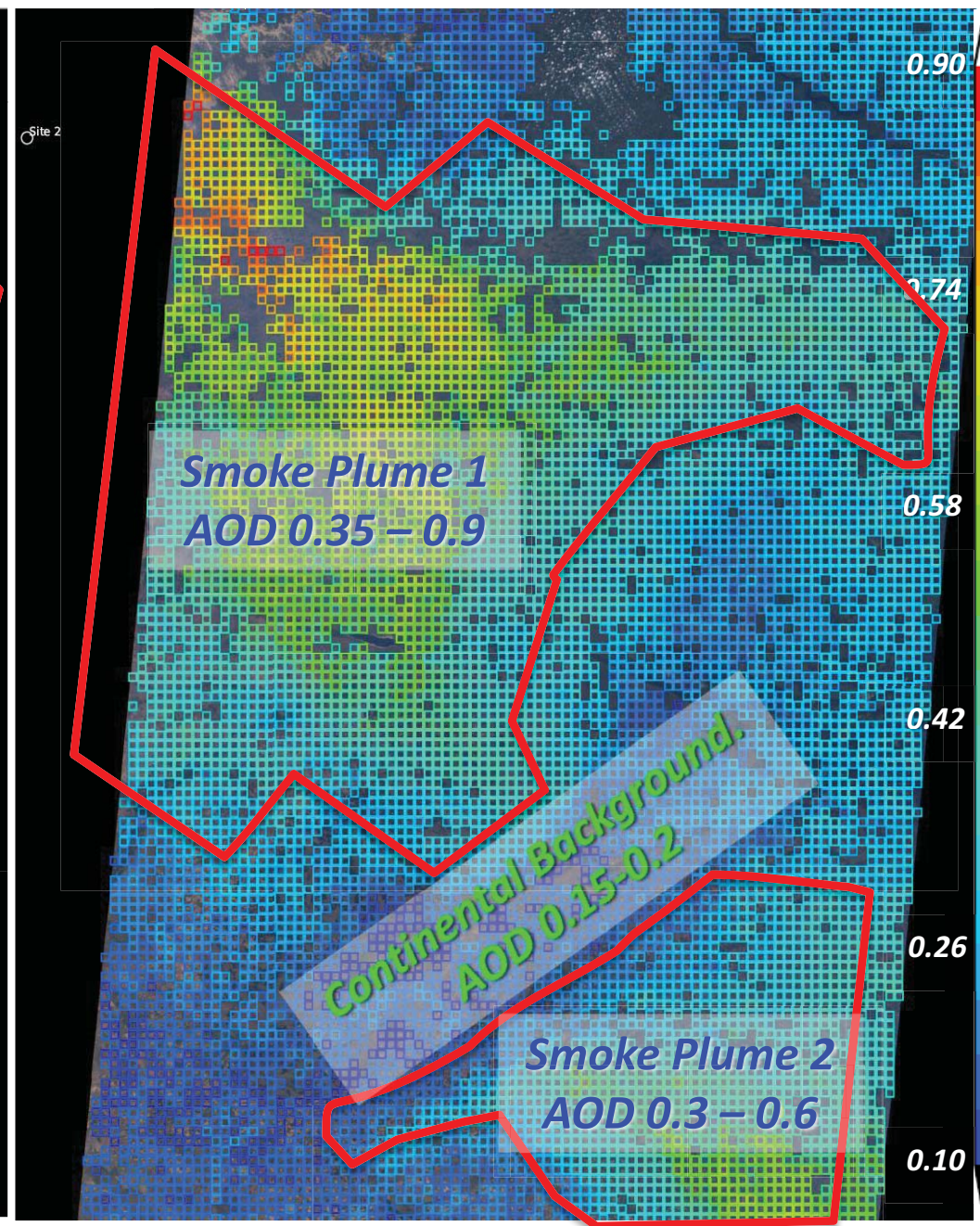
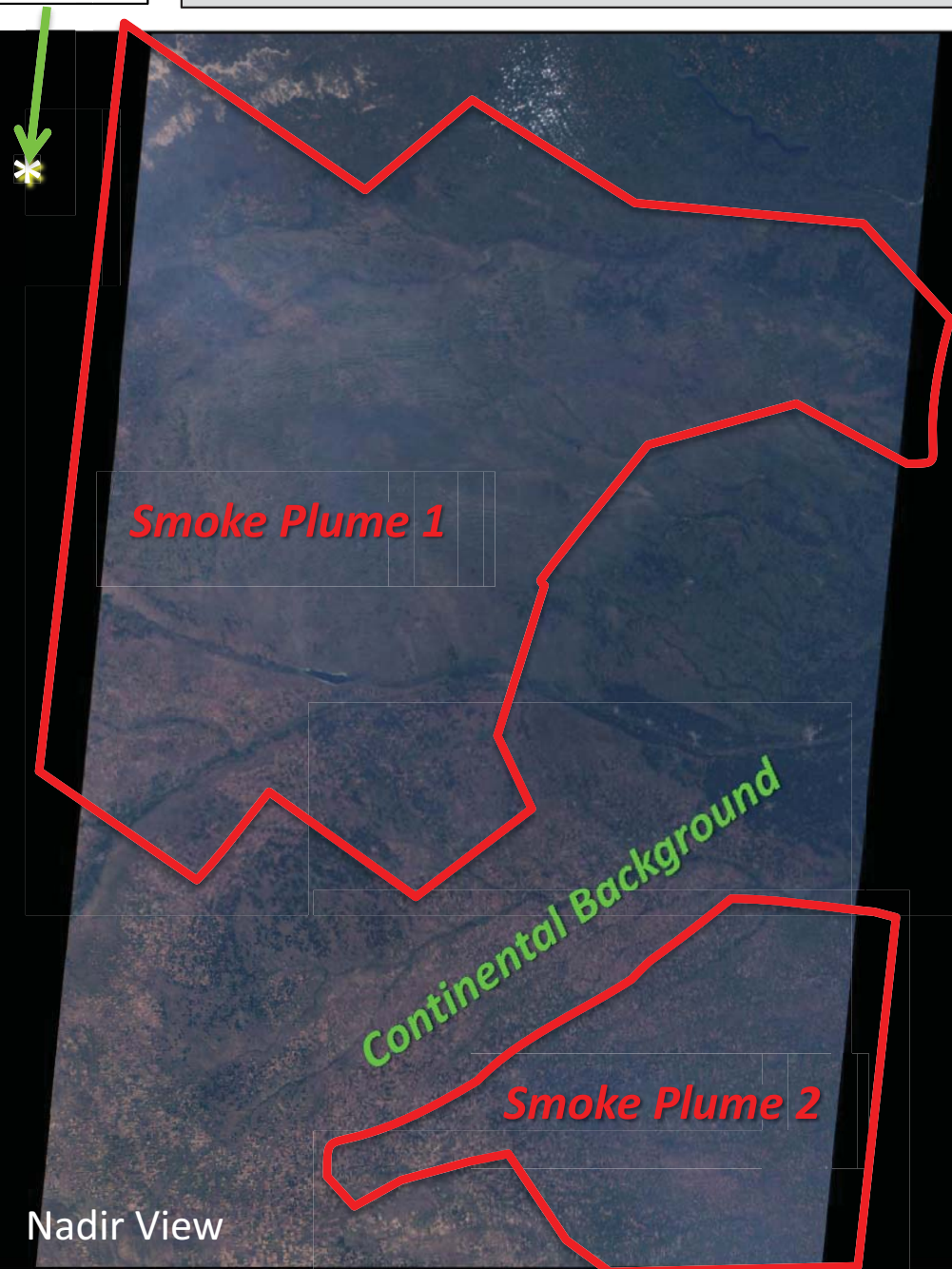




# MISR Aerosol Optical Depth (Research Algorithm)

19 August 2013

Site 2

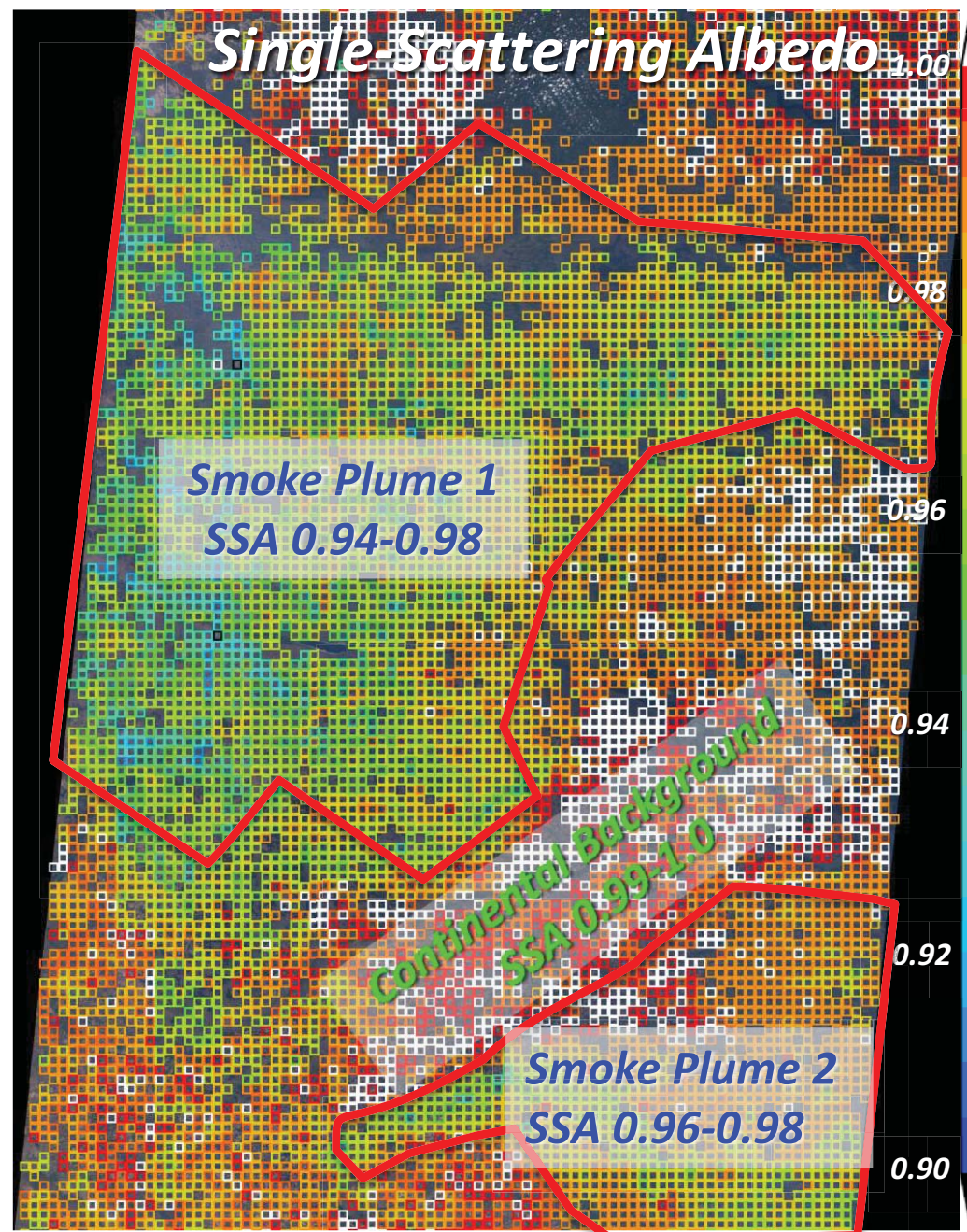
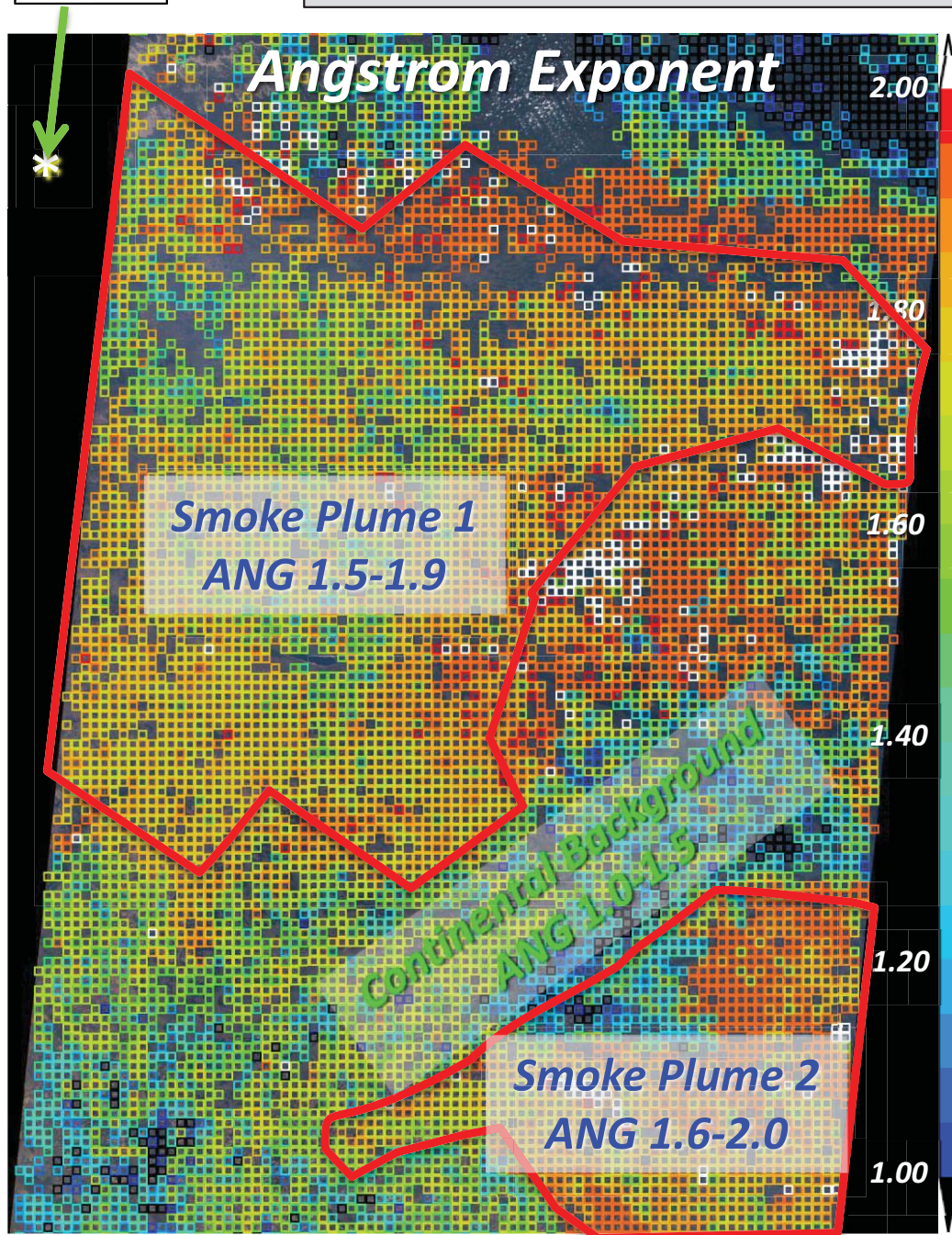




# MISR Aerosol Type (Research Algorithm)

19 August 2013

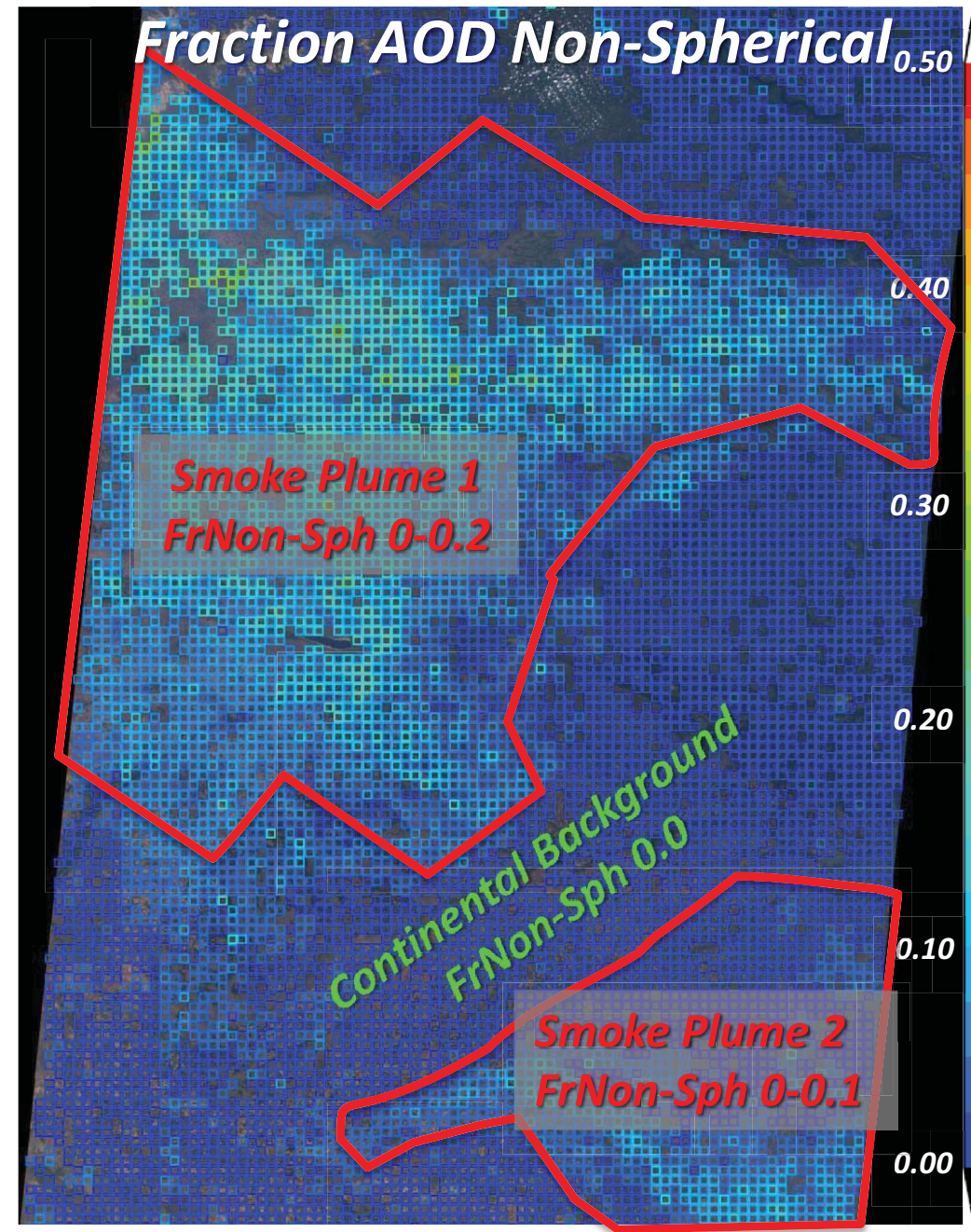
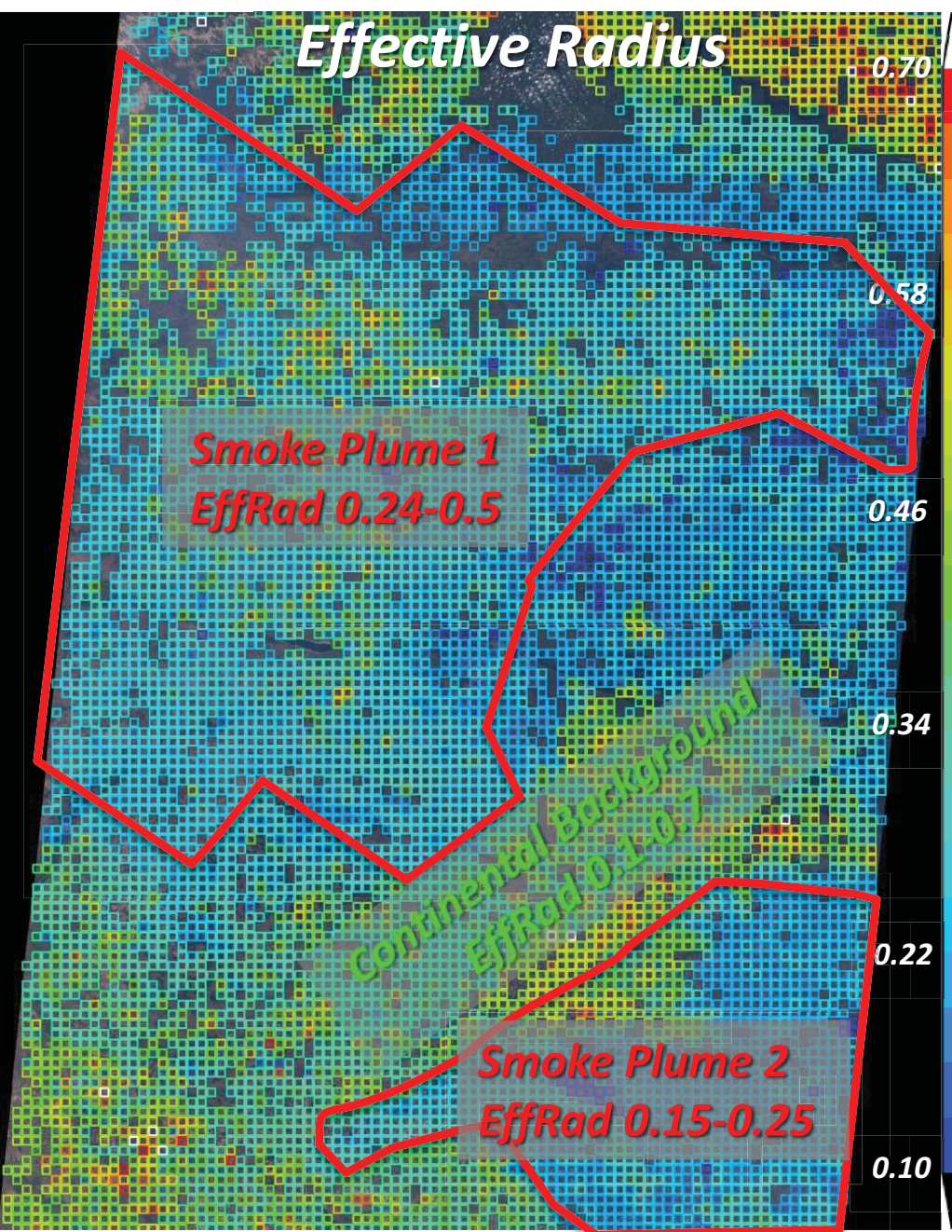
Site 2





# MISR Aerosol Type (Research Algorithm)

19 August 2013

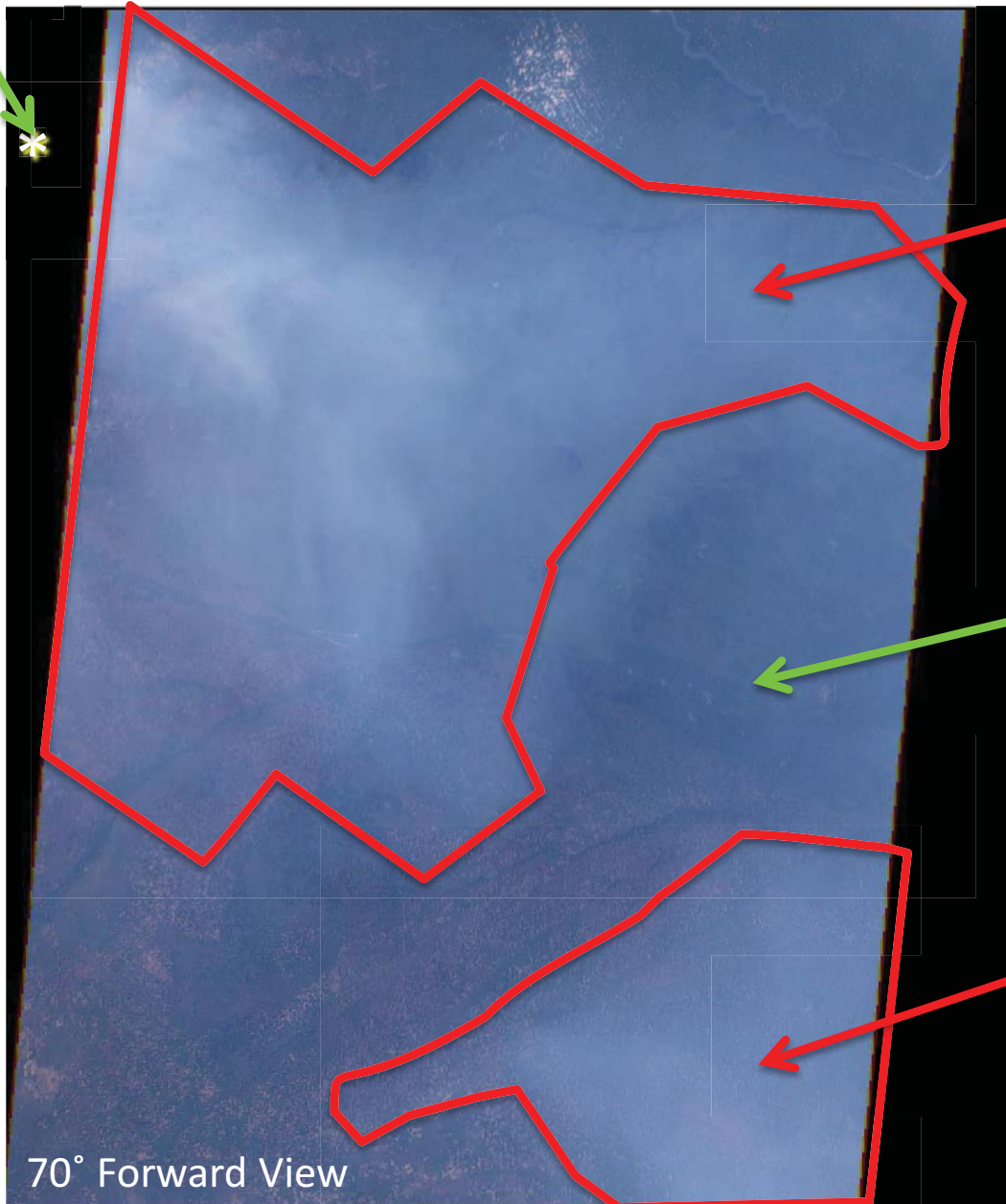




# MISR Aerosol Type (Research Algorithm)

19 August 2013

Site 2



## Smoke Plume 1

AOD 0.35-0.9

ANG 1.5-1.9 (*small*)

SSA 0.94-0.98 (*absorbing*)

FrNon-Sph 0-0.2 (*mostly spherical*)

## Continental Background

AOD 0.15-0.2

ANG 1.0-1.5 (*medium*)

SSA 0.99-1.0 (*non-absorbing*)

FrNon-Sph 0.0 (*spherical*)

## Smoke Plume 2

AOD 0.35-0.6

ANG 1.6-2.0 (*smaller*)

SSA 0.96-0.98 (*less absorbing*)

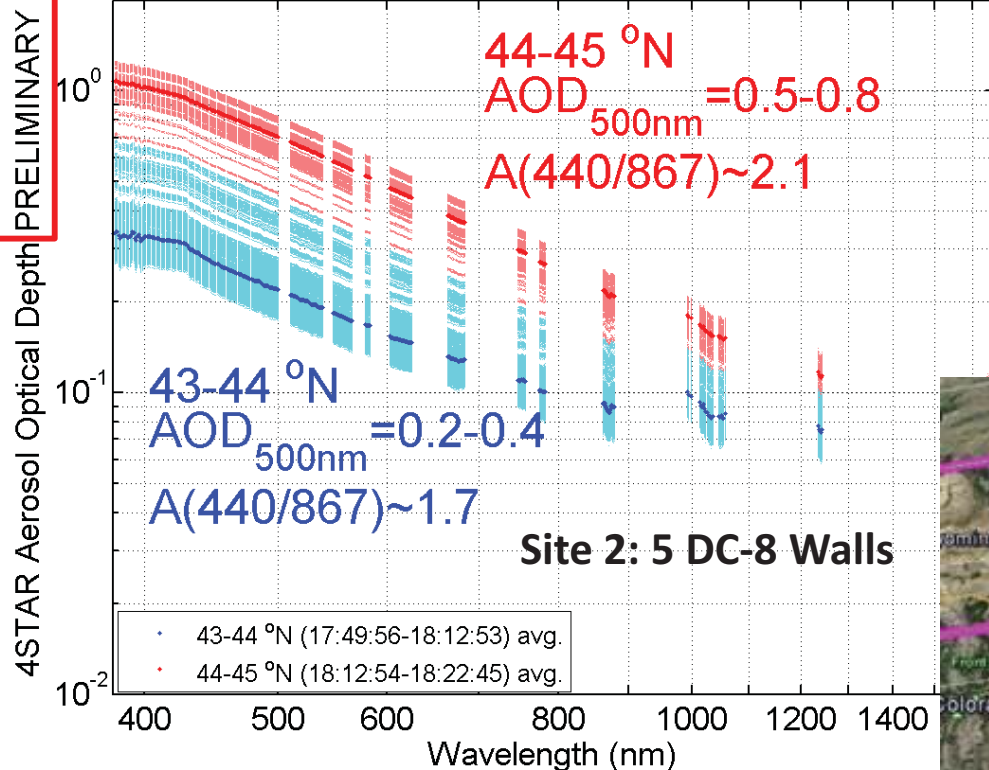
FrNon-Sph 0-0.1 (*more spherical*)

70° Forward View

Passive-remote-sensing **Aerosol Type** is a **Total-Column-Effective, Categorical** variable!!



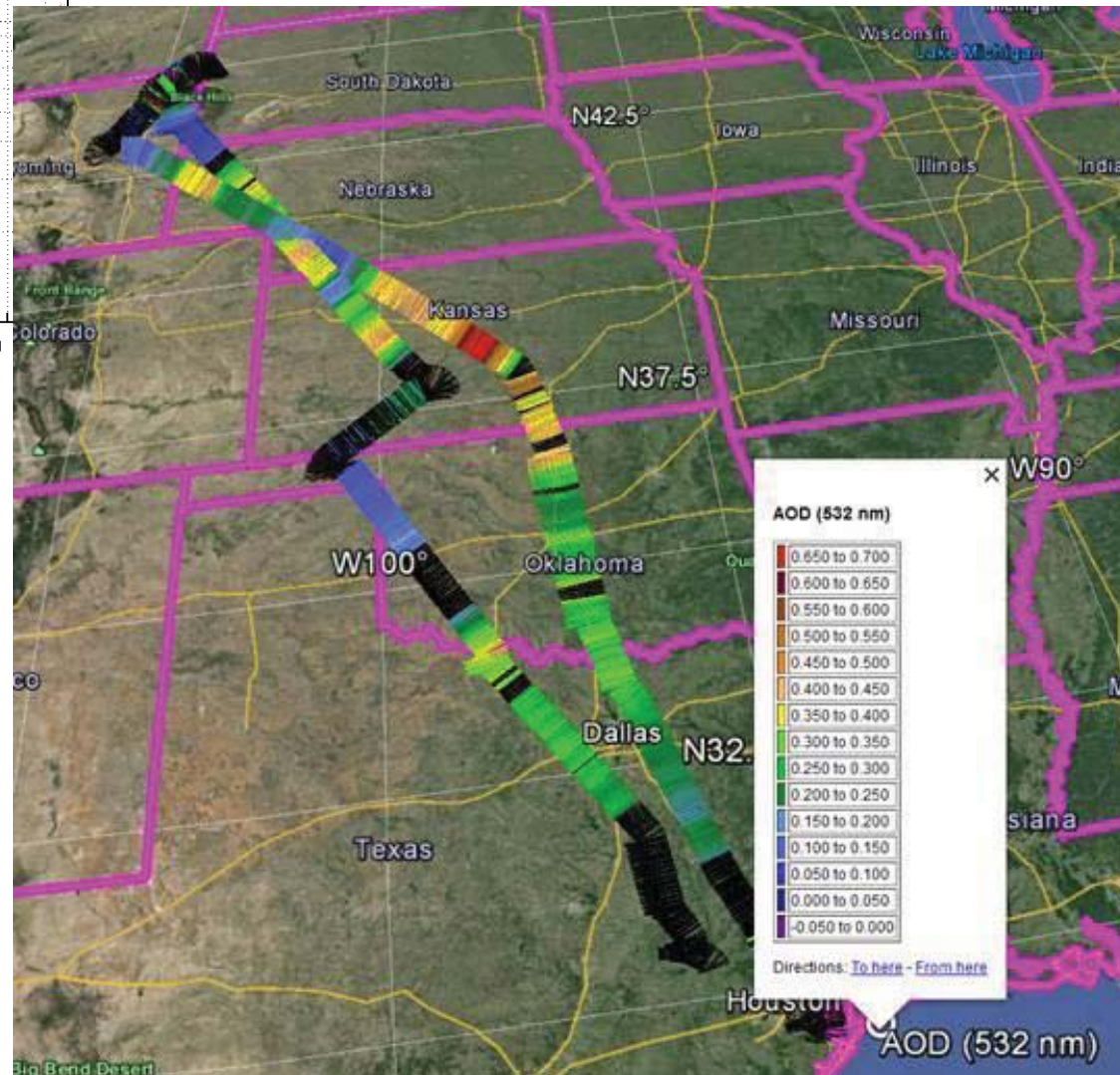
20130819, DC-8 2 km Alt.



## MISR AOD/ANG

### Validation

19 August 2013



## MISR Smoke Plume 1

AOD 0.35-0.9

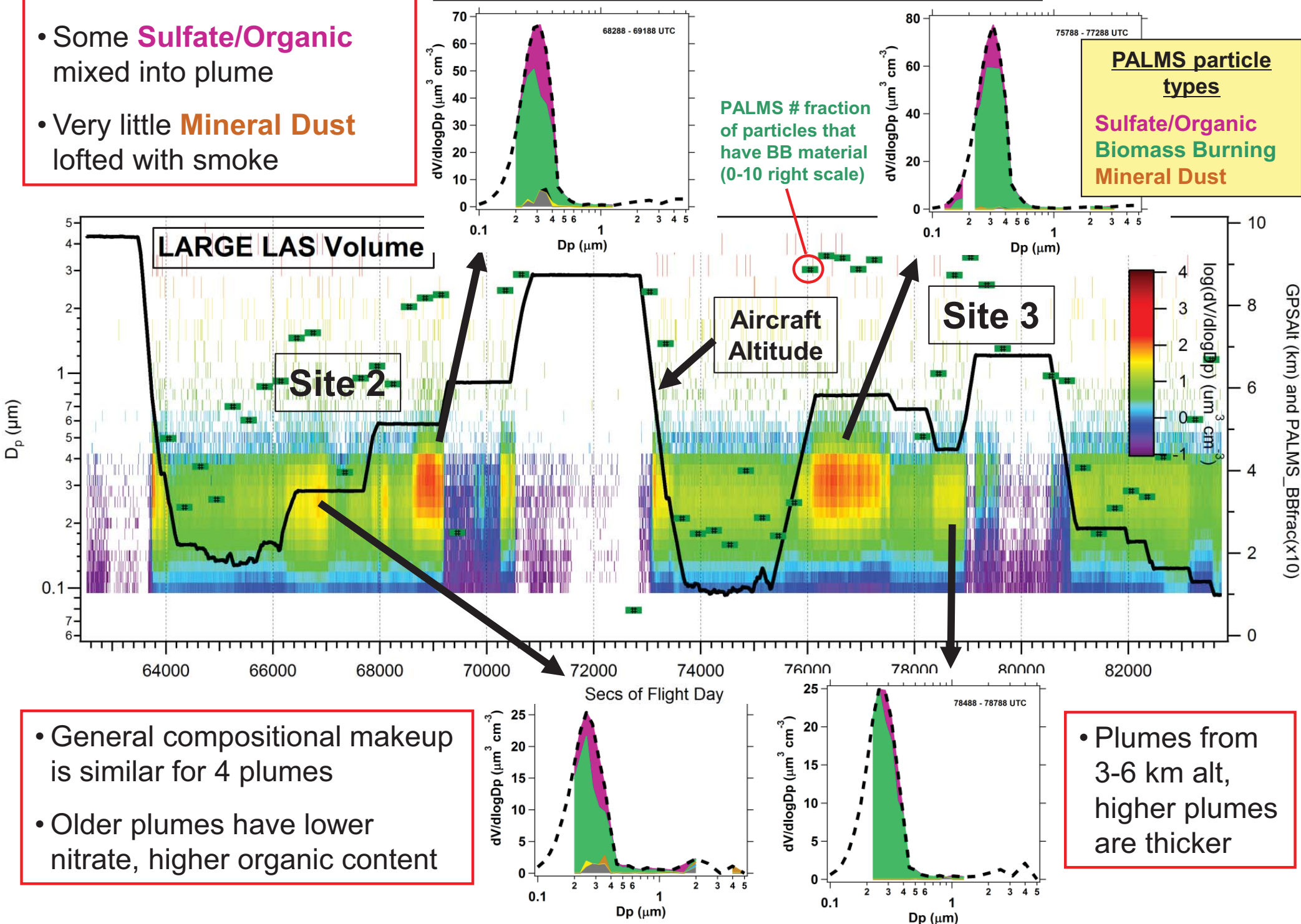
ANG 1.5-1.9 (*small*)

SSA 0.94-0.98 (*absorbing*)

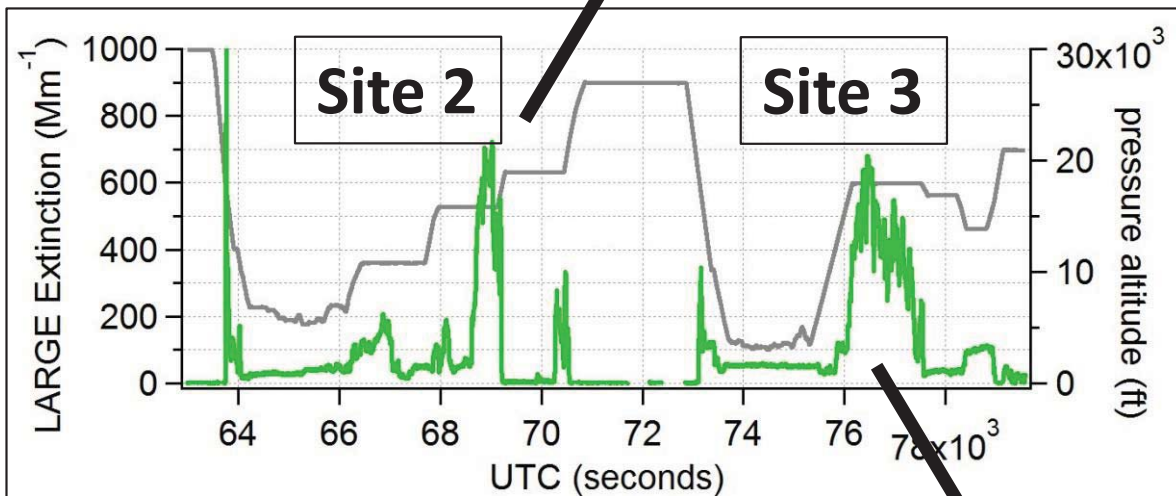
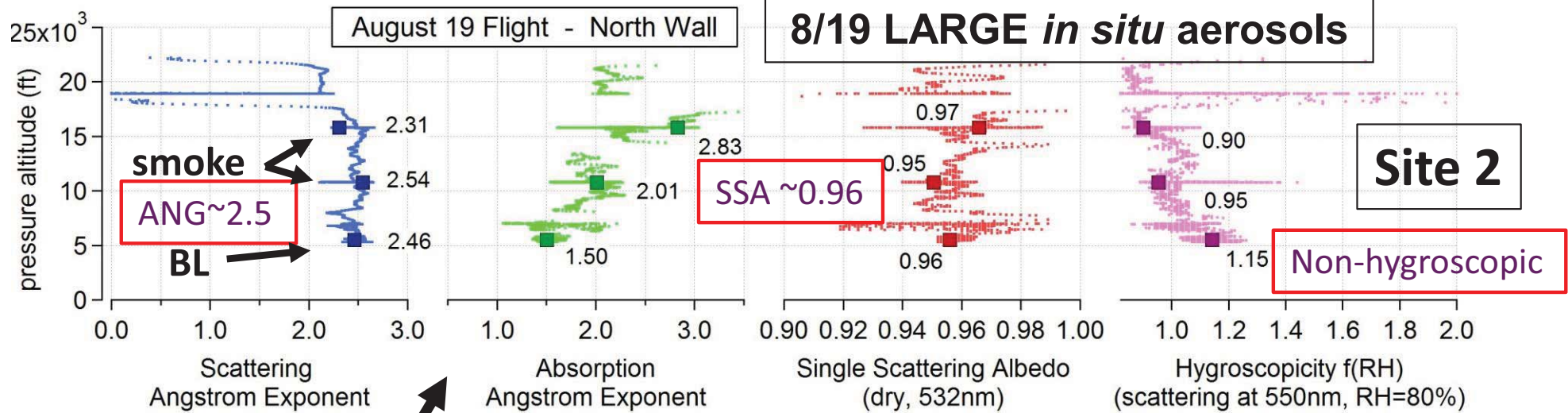
FrNon-Sph 0-0.2 (*mostly spherical*)

HSRL Team, Ferrare et al.

- Mostly **BB particles**
- Some **Sulfate/Organic** mixed into plume
- Very little **Mineral Dust** lofted with smoke

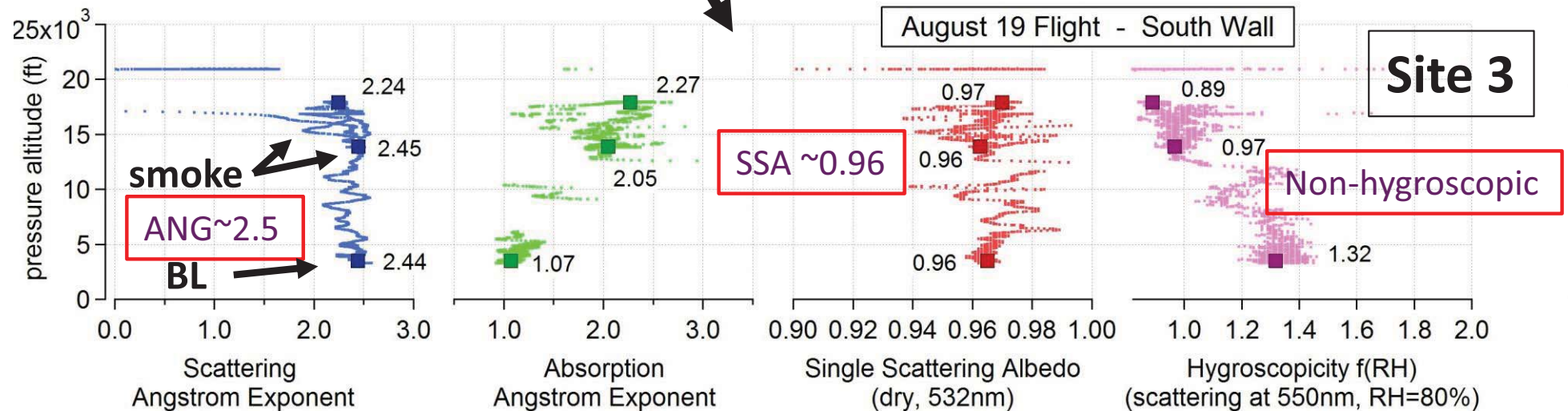
8/19 PALMS + LARGE *in situ* aerosol





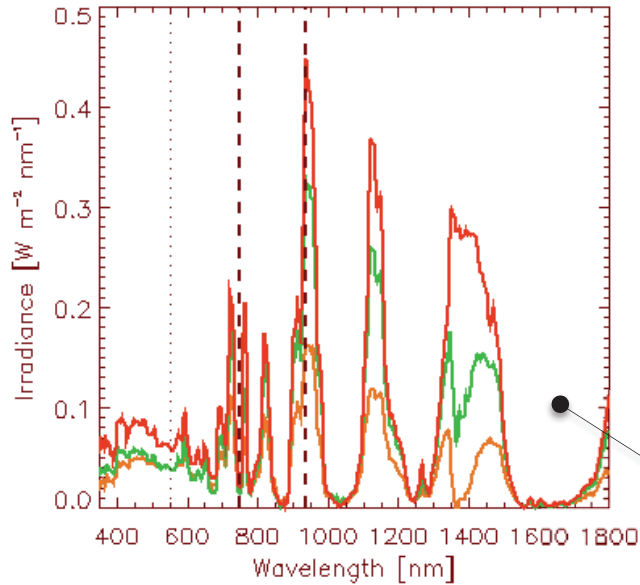
**MISR Smoke Plume 1**  
SSA 0.94-0.98 (*absorbing*)

- Altitude-dependence of optical properties is relatively unchanged between the plumes
- Smoke plume is **non-hygroscopic**
- SSA and abs-AE indicate **organic coatings are significant**

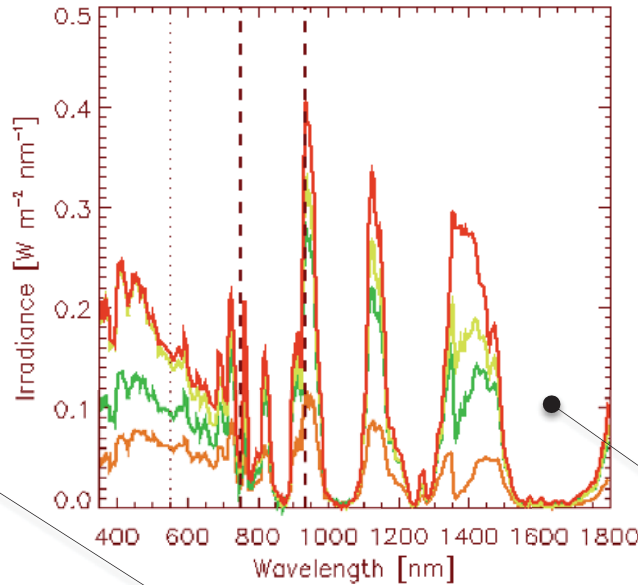


# Site 2 Upwind Smoke: SSFR Multiple Layer SSA

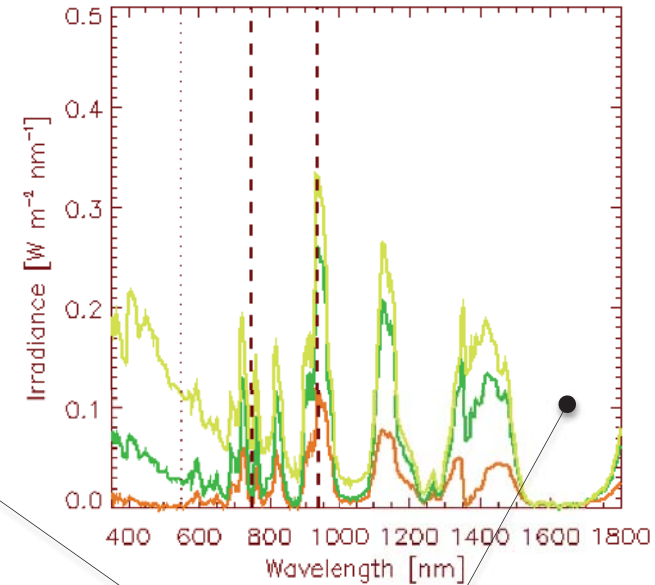
lat=43.73°



lat=44.23°

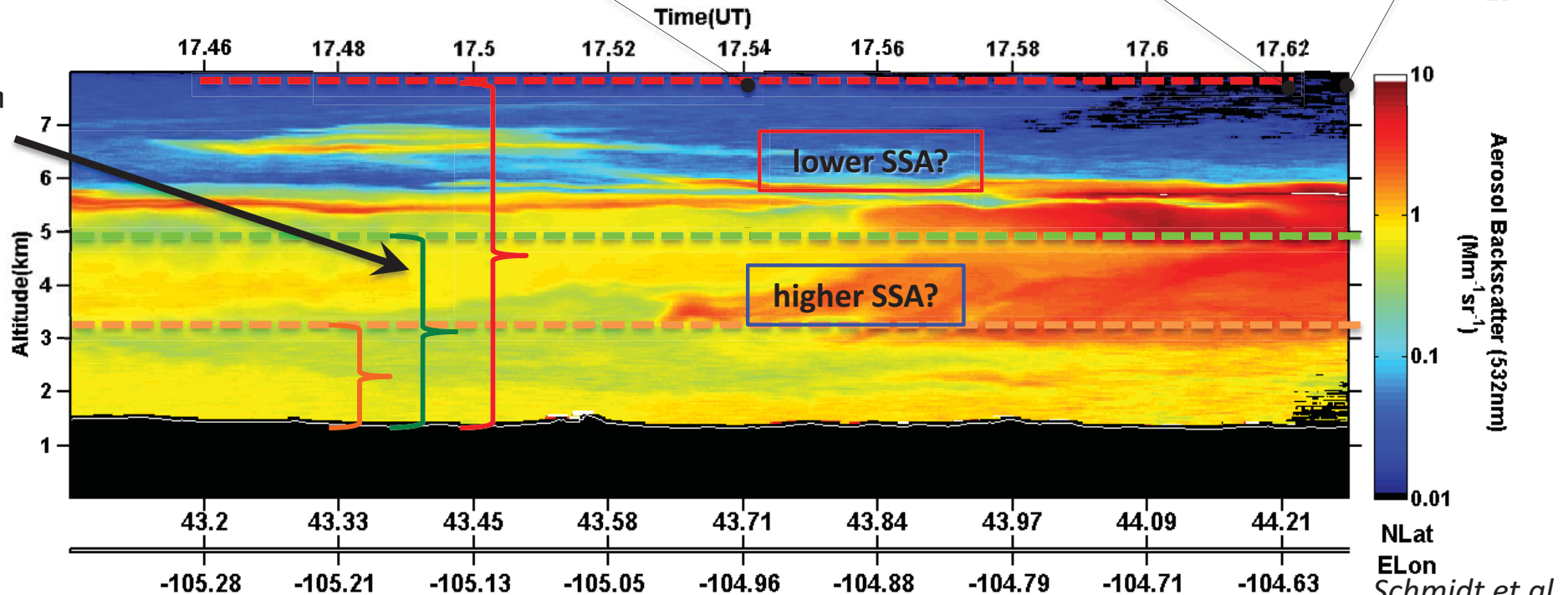


lat=44.35°



20130819

SSFR  
absorption  
/heating  
rate slices



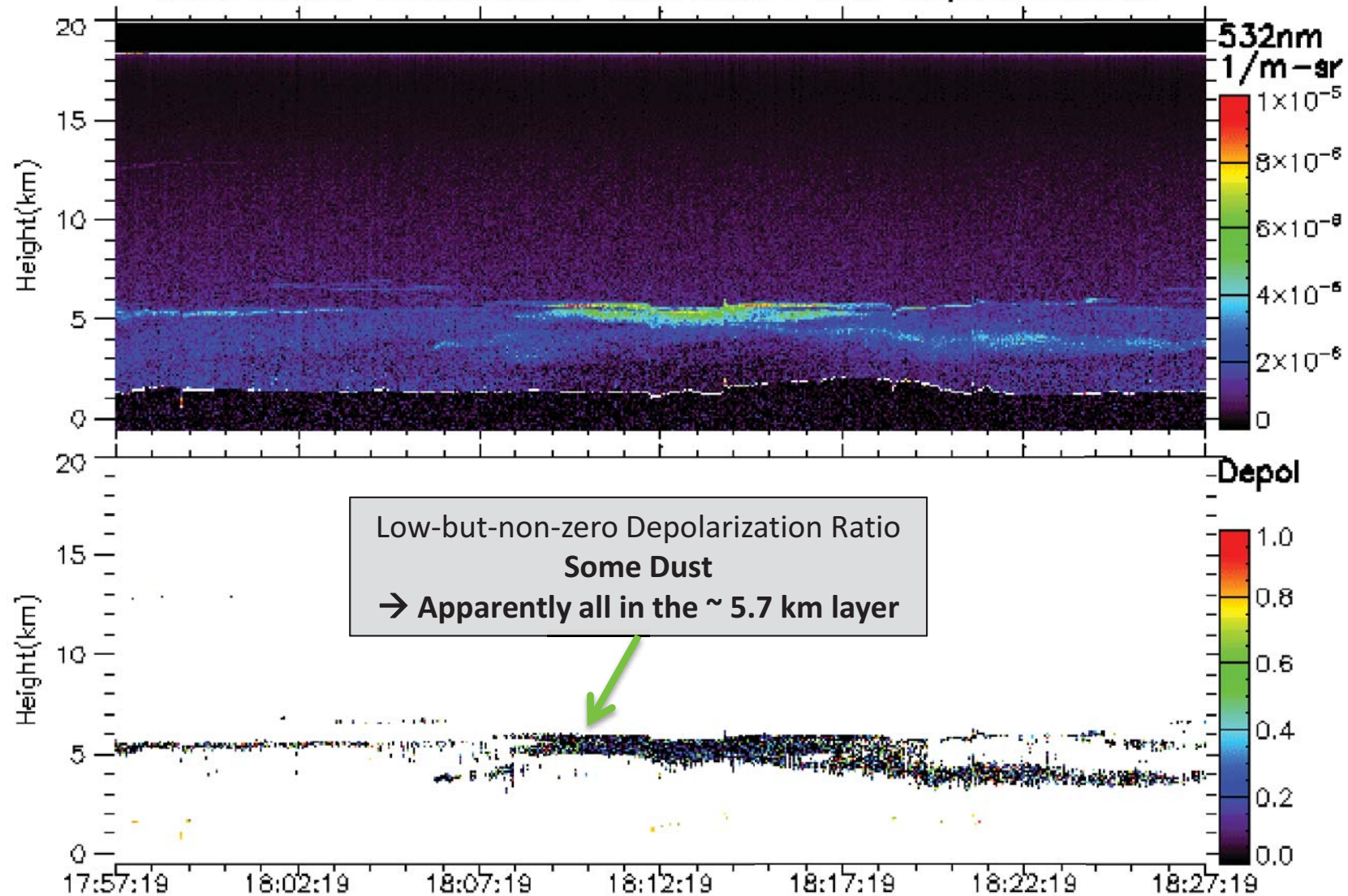


# CPL Backscatter & Depolarization Ratio

19 August 2013 Site 2 Rosette

ER2-CPL SEAC4RS 19Aug13

Attenuated Backscatter Coefficient and Depolarization

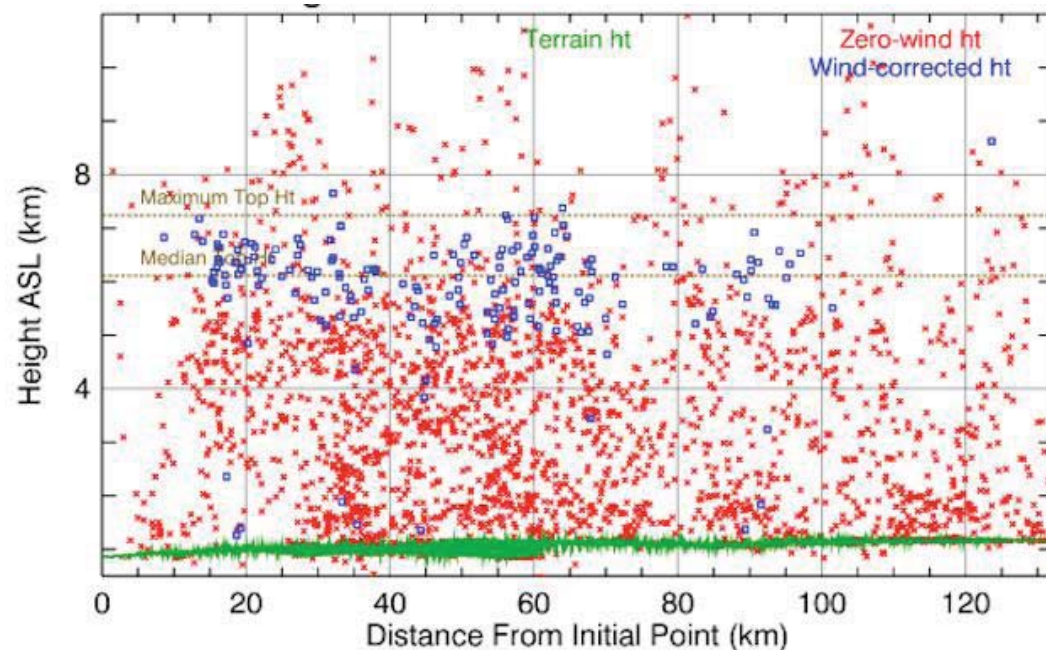
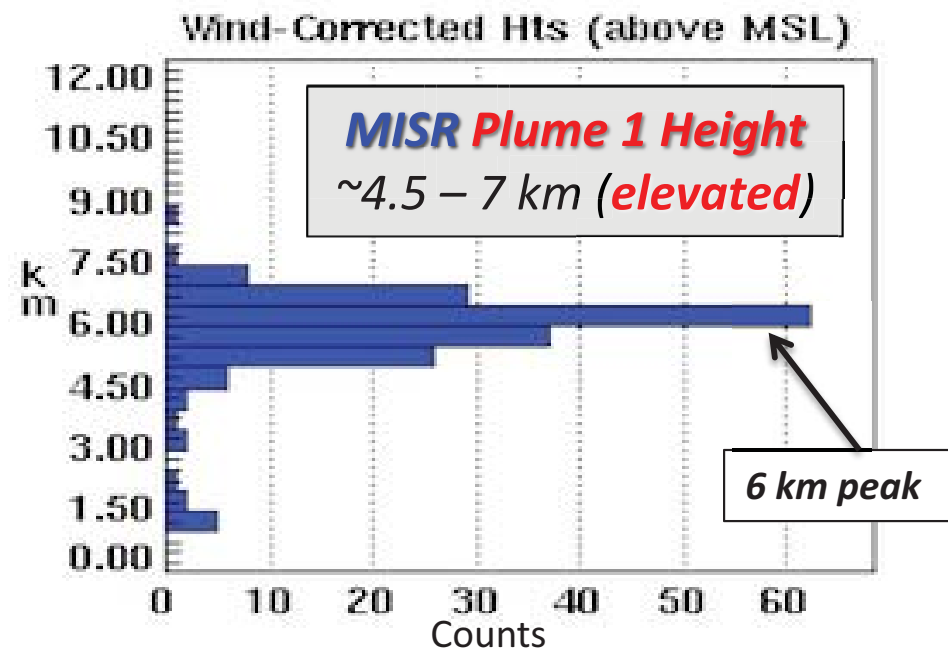
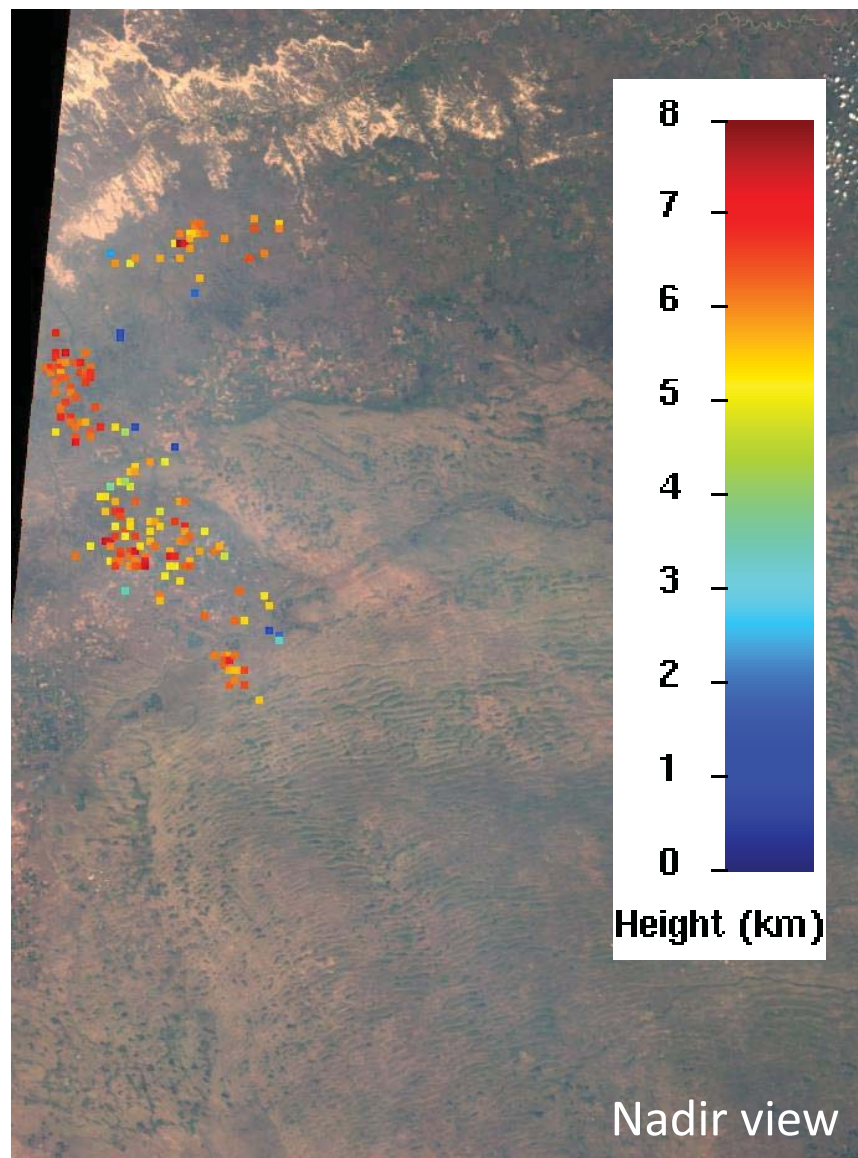


**MISR Smoke Plume 1**

FrNon-Sph 0-0.2 (*mostly spherical*)

# MISR Plume Height (Level of Max Contrast) Near Site 2

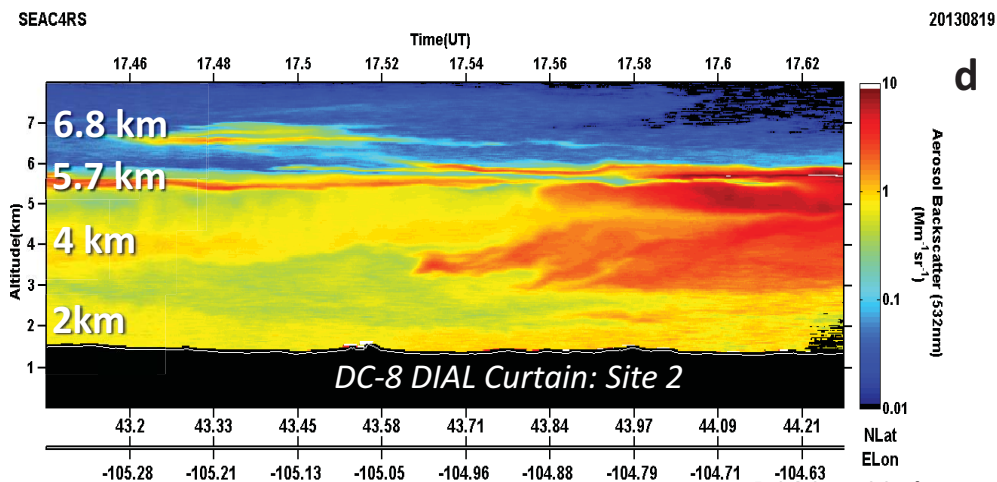
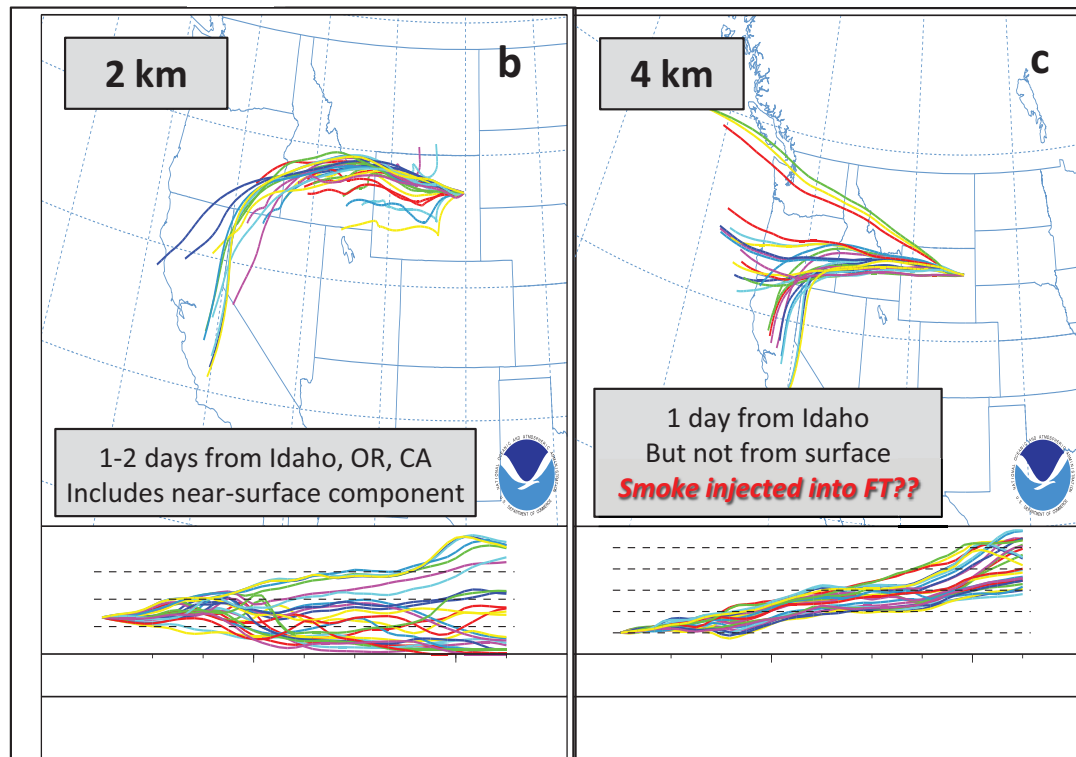
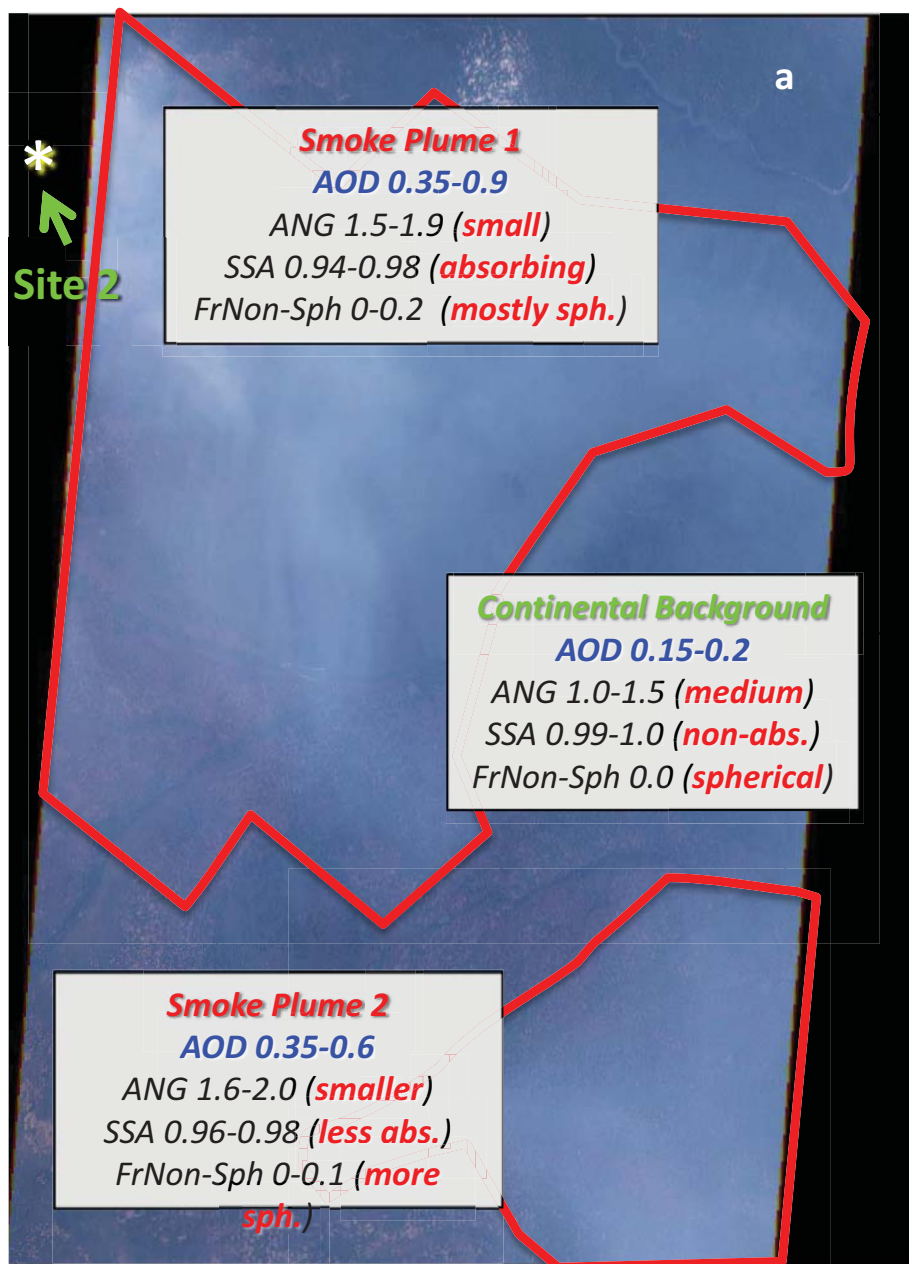
19 August 2013





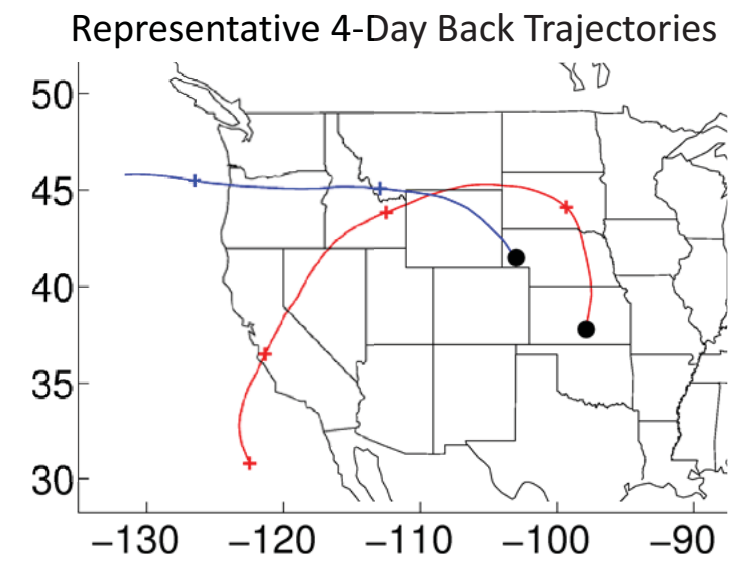
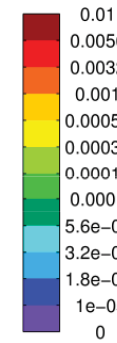
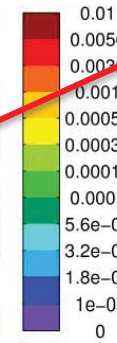
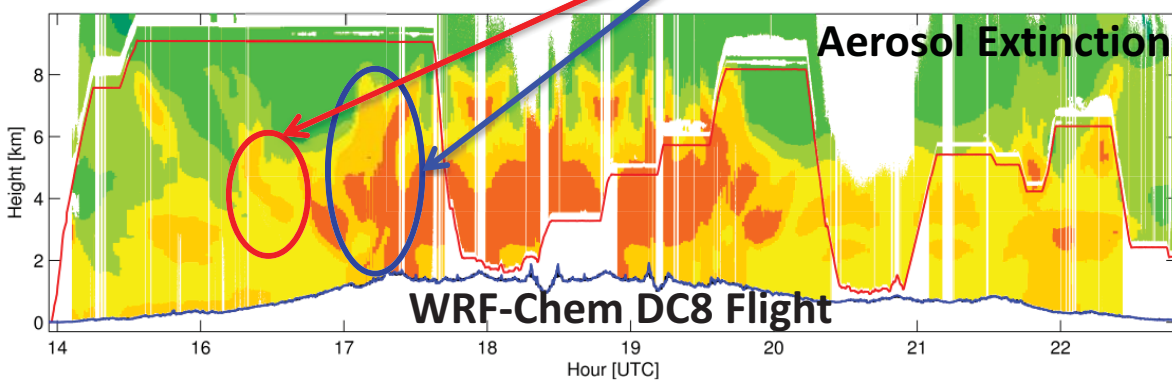
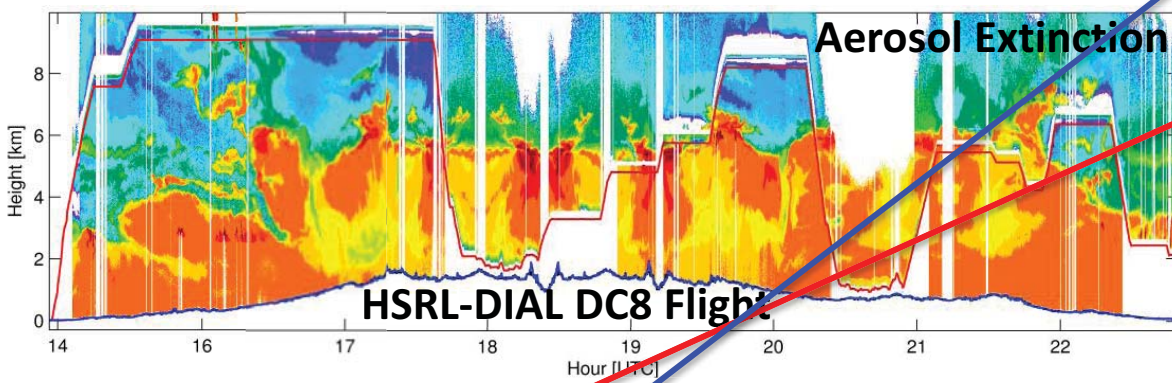
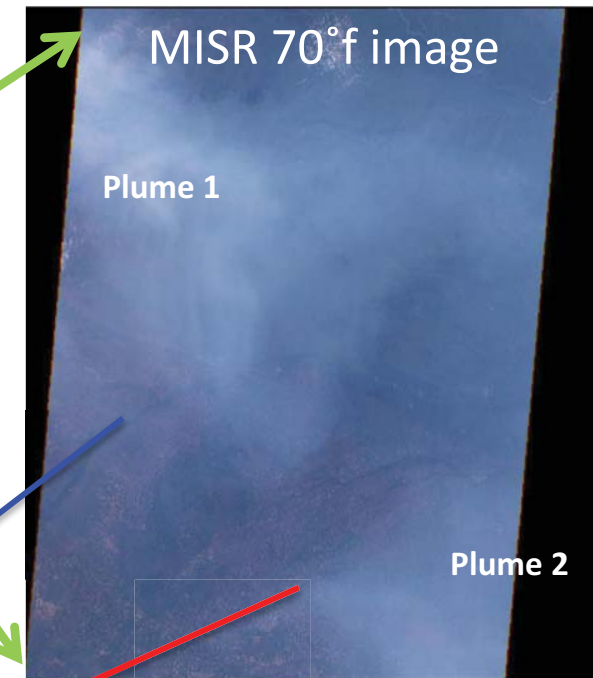
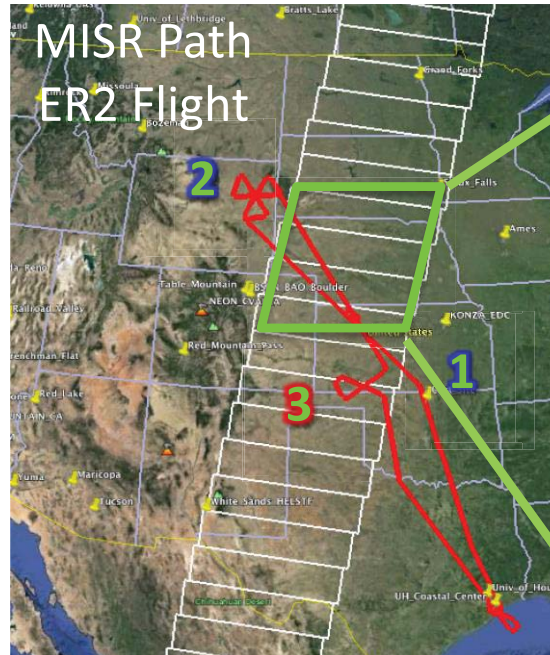
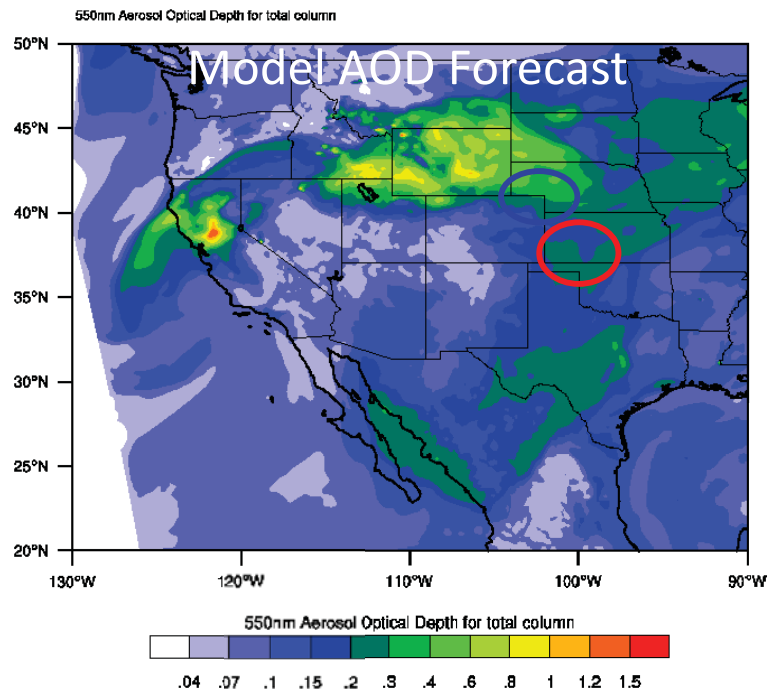
# Site 2 Smoke Transports

19 August 2013



DIAL – Hair et al.

# U. Iowa Modeling SEAC4RS 19 August 2013

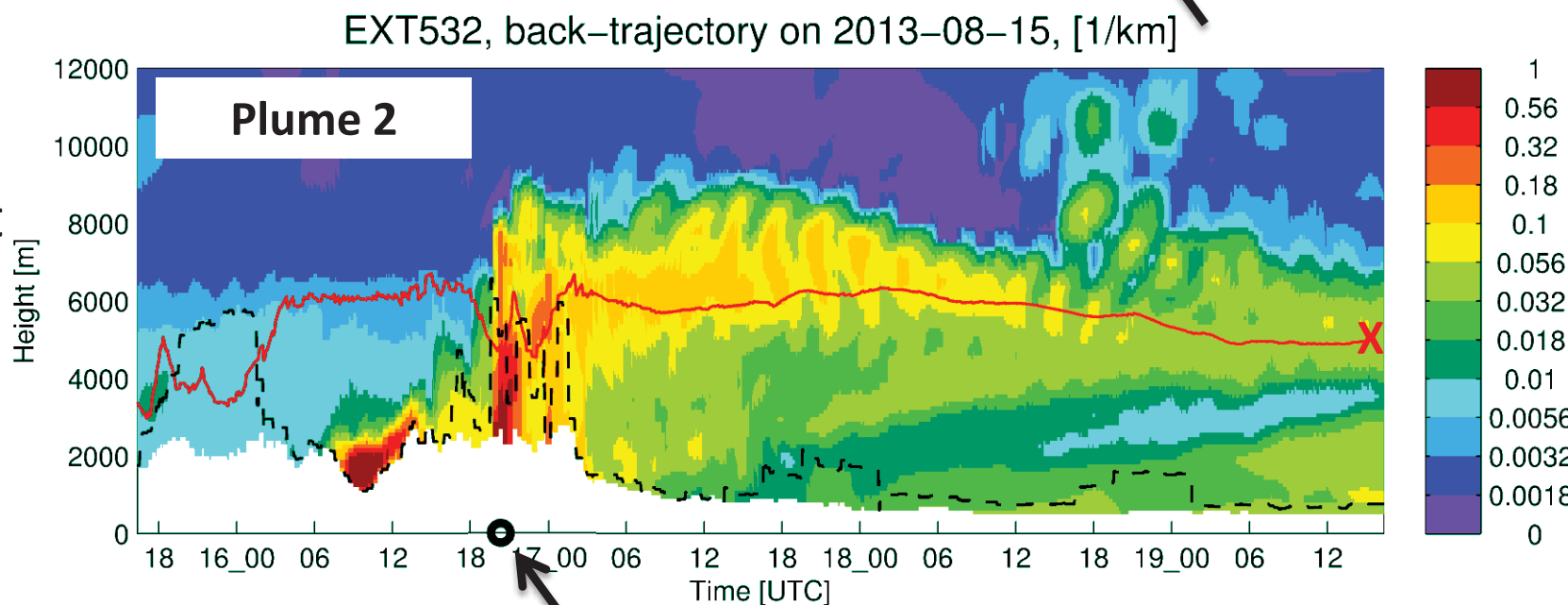
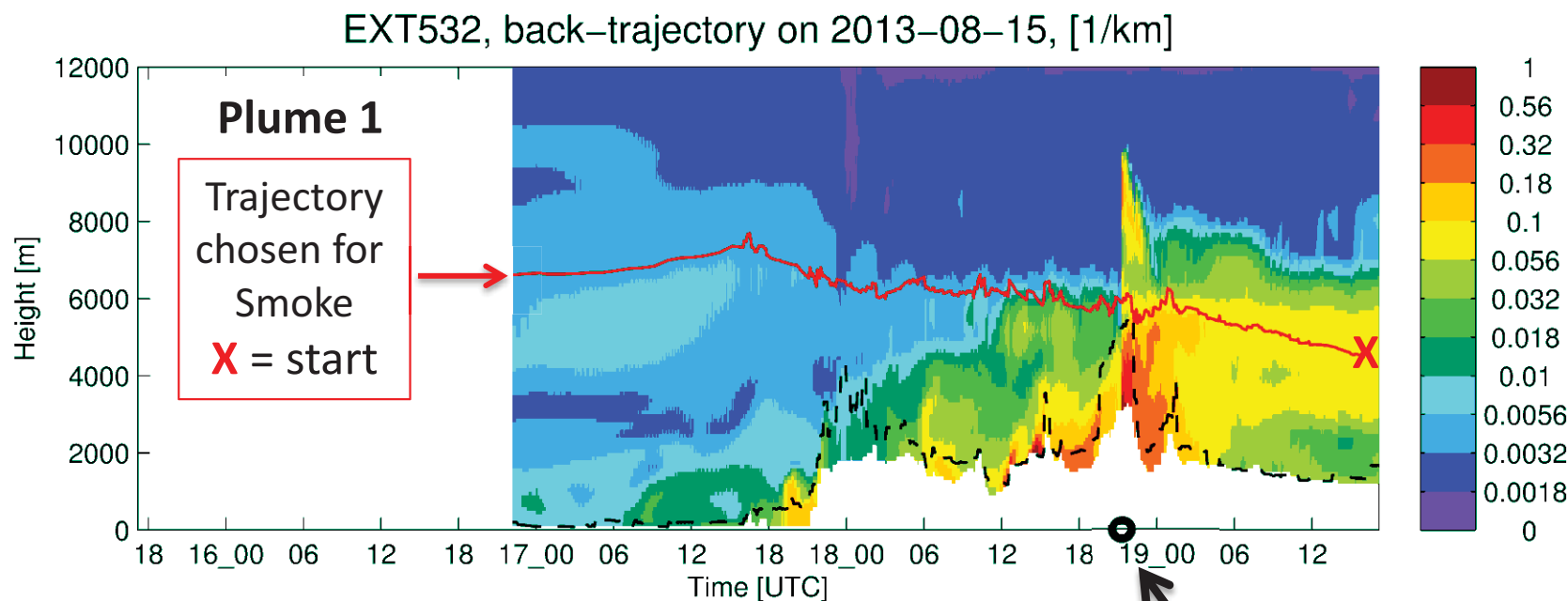


WRF modeling – Saide et al.



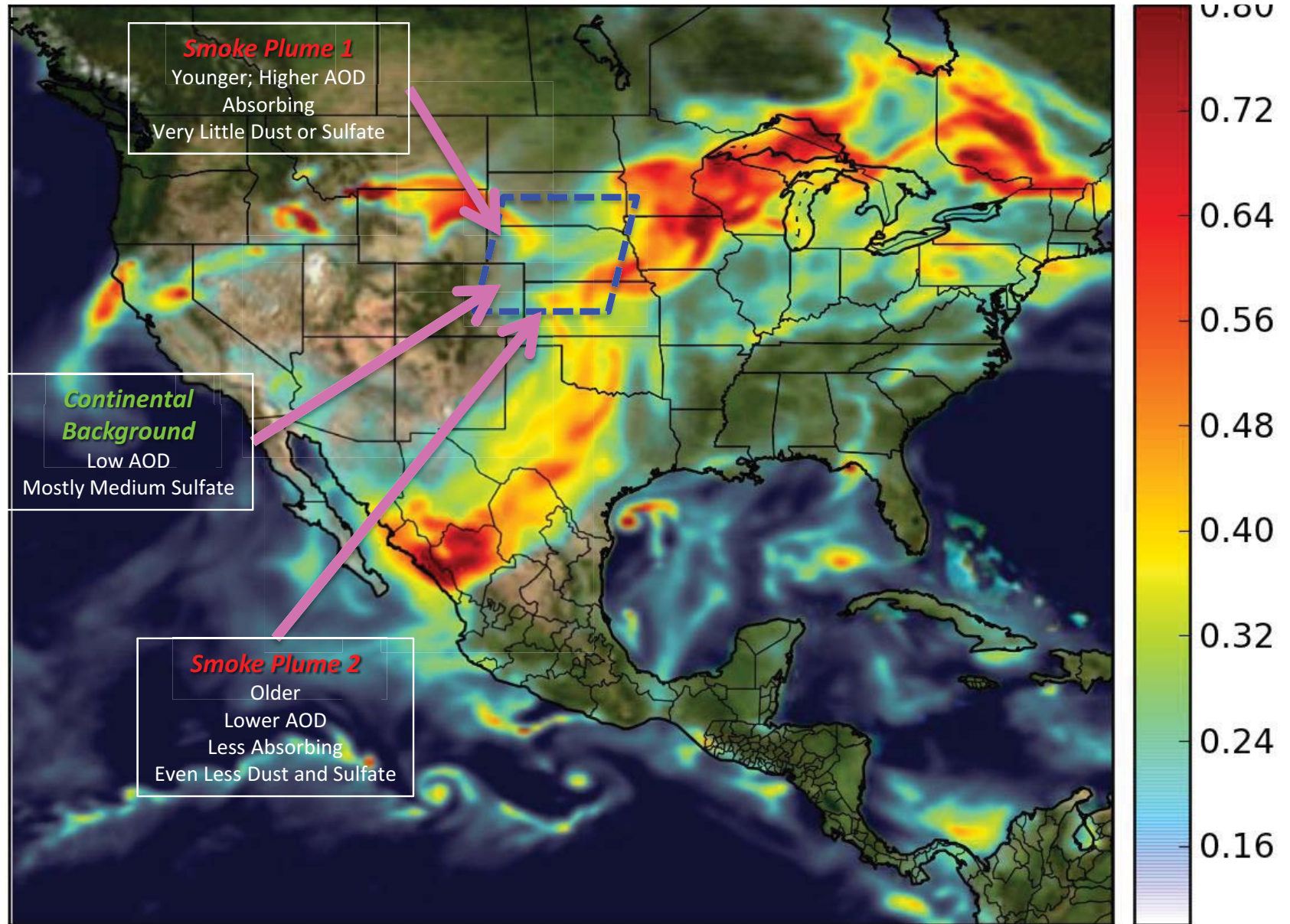
# *U. Iowa Modeling – Curtain Along Back Trajectory*

- Red solid line: Particle height
- Black segmented line: PBL height
- Black circle: first fire location that the particle intersects



# GEOS-5 MODEL Aerosol Optical Depth

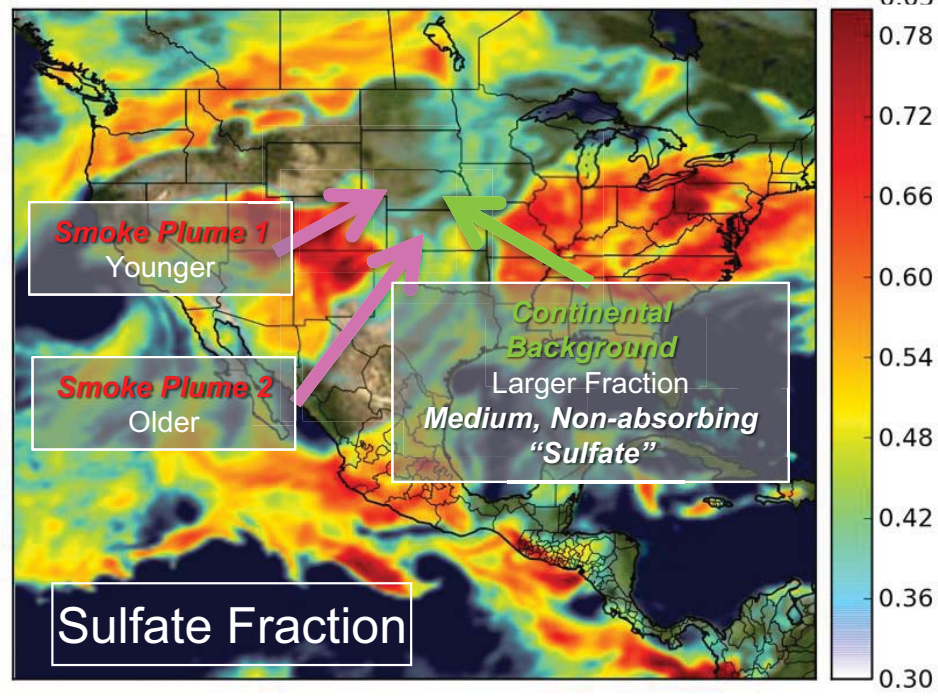
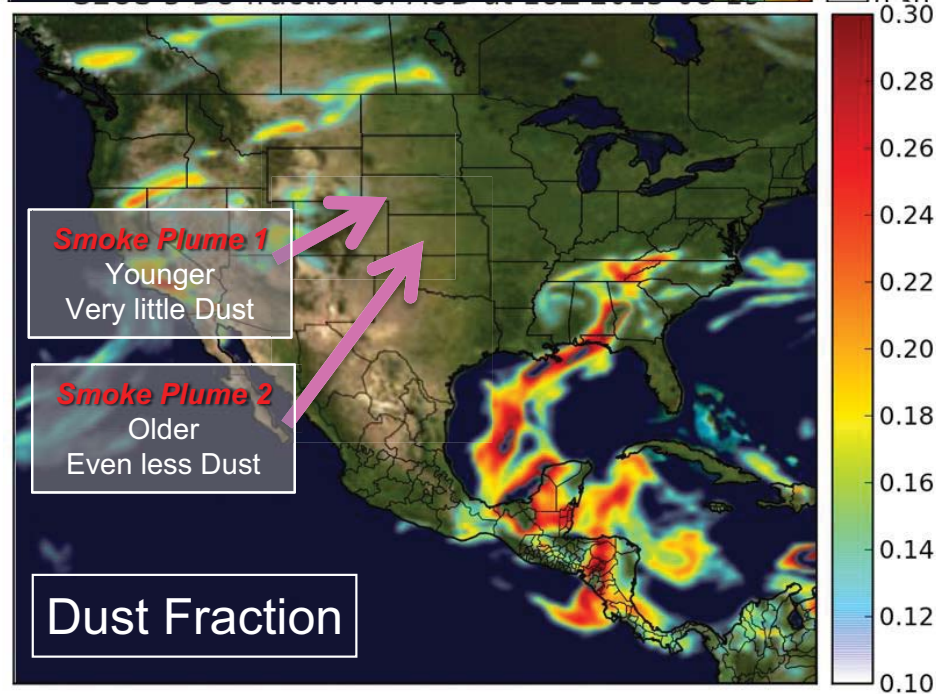
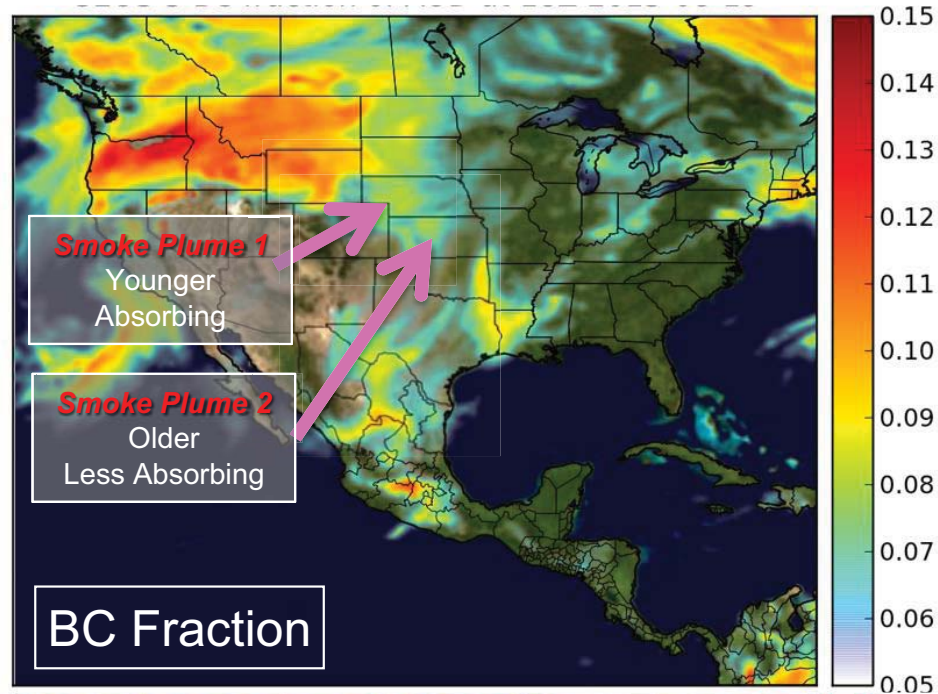
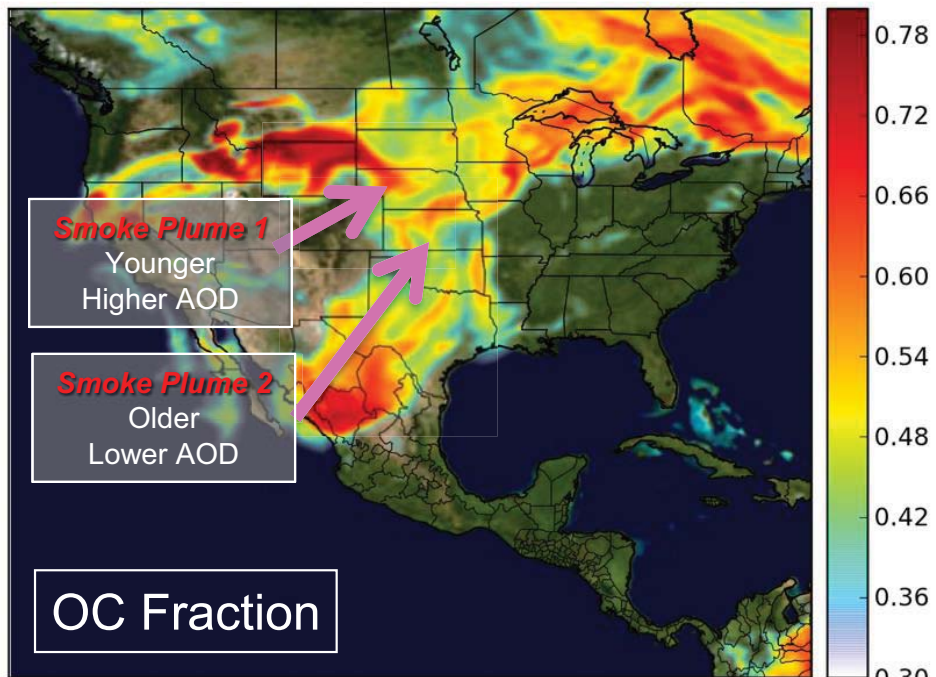
19 August 2013 18 UTC





# GEOS-5 MODEL Aerosol Type

19 August 2013 18 UTC





# MISR Summary 19 August 2013

